Kew Bulletin

PUBLISHED FOR THE ROYAL BOTANIC GARDENS, KEW
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No. 1, 1948

REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1947.

The following appointments to the staff are recorded:—

As Scientific Officer:

Mr. R. D. Meikle, LL.B.,—1st December, 1947.

As Assistant Experimental Officers :

Miss P. Lewis, B.Sc.—16th June, 1947.
Miss E. M. Slatter, B.Sc.—10th December, 1947.

The Herbarium

The re-arrangement of the Herbarium has been completed, including the re-labelling of the cabinets, and most of the arrears of laying-in have been overtaken. The following figures indicate some of the routine work accomplished :

Number of specimens received for the Herbarium 37,083.
" " " " on loan 4,336.
" " " sent on loan 2,460.
" " " distributed as duplicates 5,527.
" " " mounted 9,546.

The herbarium was visited by 3,550 botanists and other visitors.

The staff is still very considerably under strength though there has been some slight improvement in recruitment during the year.

Visitors are using the Herbarium and Library in increasing numbers and for longer periods. In particular valuable research has been done (and in part is being continued) by Dr. N. L. Bor (*Gramineae*), Dr. A. Parsa (flora of Persia), Mr. P. R. O. Bally (flora of Kenya), Mr. P. Davis (flora of the Nearer East), Rev. H. Santapau (flora of Bombay), Dr. and Mrs. H. Lewis (*Plectranthus*), Dr. W. Robyns (flora of the Belgian Congo), members of the staff of the Imperial Forestry Institute, Oxford (mainly

the flora of Tropical Africa), Dr. Pichi-Sermolli (Abyssinian flora)and Mr. P. C. Tsoong (*Sophora*).

An important event was the publication of the Index Kewensis, Supplement X, which includes entries for 1936—1940 inclusive and consists of 251 pages of the usual format. Two parts of the Kew Bulletin appeared during the year and one part of the Icones Plantarum.

Members of the staff gave a course of lectures on Plant Taxonomy to advanced students in the Department of Botany, University of Oxford, during the Hilary and Trinity terms. Four broadcasts on botanical subjects were also given by members of the staff in 1947.

Dr. Turrill has been appointed editor of The Botanical Magazine by the Council of the Royal Horticultural Society.

Europe, Orient, and N. Africa. Work has been focussed largely on the Nearer East and the account of E. R. Guest's large collections from Iraq has been half completed for publication. Research has continued in the preparation of revisions of *Crocus* and *Euonymus* and papers based on Kew material have been published by visitors on the flora of the Nearer East, (Davis : *K.B.* 1947, 64 ; Zohary and Davis : l.c. 87 ; Parsa : l.c. 17).

China and Japan. Much time has been spent on geographical rearrangement and revision of naming of the collections. Investigation of *Sarcococca* and *Camellia* is being continued along monographic lines.

Malaya. Routine identification included : work on *Syzygium* (Myrtaceae) of the Oxford University Expedition to Sarawak, and on the *Lauraceae*, *Marantaceae*, *Zingiberaceae* and *Musaceae* of the Siamese collection of Bloembergen and Kostermans ; writing up new covers for, and rearranging, the genus *Quercus* (incl. *Lithocarpus*) in the Malay Peninsula and Indo-China ; and rearrangement of *Urophyllum*, *Praravinia* and related genera (*Rubiaceae*), by Bremekamp's recent revisions, including writing new covers throughout.

Research has included : work on *Agapetes*, *Vaccinium* and *Gaultheria*, with especial reference to some of Kingdon Ward's material, received on loan from America (Arn. Arb. etc). ; writing an account of *Spenocleaceae* for *Flora Malesiana* ; investigation of genus *Dionocophyllum* and preparation of a preliminary account of a new family.

Tropical and South Africa. Many valuable collections have been received especially from British and Portuguese colonies. Long lists of determinations have been supplied to correspondents and though shortage of staff prevents the overtaking of arrears the results of the year's work are encouraging. Among groups being specially investigated are : *Marantaceae*, *Amorphophallus*, *Utricularia*, *Otiophora*, *Ceropegia*, *Dionchophyllum*, *Thonningia*, *Aidia*, and *Lachnosiphonium*.

America. Work has been concentrated on C. Sandeman's large collections from Peru (*Polypetalae* and *Rubiaceae*) and on the war-time collections made by the Forest Department of British Guiana. The determinations of T. A. Sprague's collections from Venezuela and Colombia have been completed.

Orchidaceae. Orchids from many collections have been determined and special attention has been given to living material grown in the Gardens. The European and Oriental orchids have been re-arranged according to Schlechter and Keller's recent monograph and the orchid drawings to conform with the Herbarium arrangement. Research was concentrated on African orchids, in particular on the genus *Tridactyle.*

Gramineae. Approximately 1250 specimens have been determined. Over 300 packets of grains have been supplied to institutions in this country and abroad for cytological research. Numerous reports on grasses and grasslands, taxonomic, ecological, and economic have been supplied to correspondents. Research has been largely on Tropical African grasses, including those of Nyasaland (Brass collection). The genus *Perotis* and its allies have been revised.

Cryptogams. In the Vascular Cryptogams attention has particularly been paid to the ferns of British Tropical African colonies. Routine naming, and laying in, and curatorial work was continued for the Byrophyta and Algae. The Leighton collection of lichens has been incorporated in the general collection. Research in the Fungi has been concentrated on critical British leucosporous and rhodosporous *Agaricaceae*, little-known British *Ochnosporae* and *Melanosporae*, and western European *Hyaloscypheae.*

Spirit Collection and Carpological collection. Considerable progress has been made in incorporating arrears and in rearranging these collections. An increasing number of collectors supplement their herbarium preparations by pickled material. A particularly valuable series of such specimens of African *Euphorbiaceae* and *Asclepiadaceae* was received from Mr. P. R. O. Bally.

Fumigation Chamber. This was used, mainly for new in-coming collections, 15 times in the course of the year. The strict application of the rules for fumigation and poisoning of specimens, including those brought for comparison by visitors, has been very effective in reducing insect outbreaks to an insignificant number of very small attacks.

Herbarium Experimental Ground. This has been reconstituted and most of the beds prepared for use in 1948.

The Library

During 1947 opportunities for work other than that of a routine nature have been very few. It has, however, been found possible to re-arrange the periodicals and other books on the shelves in the ground floor corridor, where they badly needed to be spaced out. The orchid books which were formerly shelved here were removed to Wing A where they are more readily accessible to the Orchidologist. This move relieved the pressure on shelves already much congested.

A certain amount of time has again been devoted to the task of acquiring parts of periodicals, new works published overseas during the war, and other publications which have been noted from time to time in reviews and other journals.

The map collection has been still further enlarged by the addition of

maps from the Ordnance Survey, all of which have been catalogued and laid in. Copies of other maps have also been received from other sources.

A number of loans from the Library to other Government Departments and Agricultural Bureaux have been made during the year. We also continued to administer loans from the Bentham-Moxon collection of books on Diatomaceae.

Routine work has consisted, as usual, in dealing with incoming literature, binding, and with enquiries of a bibliographical and biographical nature. The work of cataloguing and classifying accessions proceeds in a satisfactory manner and work still in hand includes the transfer of the remainder of the collection of pamphlets and reprints into boxes and also the task of re-pressmarking.

Publications have been received from the Bentham-Moxon Trustees, British Council, Imperial Agricultural Bureaux and Departments of Botany, Agriculture, and Forestry at home, in the overseas Empire, and in Foreign countries, while a large number of botanical reprints and other publications have been received from the authors, from members of the staff, and others.

The Gardens

General

The year 1947 will be entered in horticultural records as one of the most remarkable of the century. It will be chiefly remembered for the prolonged period of arctic conditions in early spring when heavy frost was experienced for several weeks and the Gardens lay under a heavy mantle of snow. Later on there were prolonged periods of drought and during the three months, August, September and October, only 1.75 inches of rain were recorded. Apart from these periods of frost and drought the rainfall of 20·31 inches was distributed fairly evenly over the other months of the year.

Visitors

The total number of visitors in 1947 was 1,620,960. The largest attendance in any one month was in May when 417,922 persons visited the Gardens, while the figure sank to 7,366 in February, one of the coldest months.

Arboretum

Losses among the older trees have still to be recorded and eight ancient beech trees had to be felled, as well as a giant Wych Elm and three Horse Chestnuts.

The very severe weather experienced during the earlier part of the year caused hovoc among the less hardy evergreen species of shrubs and small trees. Frost-tender species such as *Ceanothus*, *Cistus*, *Helianthenum*, suffered severely, and no less than 45 specimens of *Ceanothus* were lost. Some of the less hardy Ericaceae in the neighbourhood of King William's Temple also suffered.

Some of the Mexican oaks, which were raised from seed nearly 100

years ago and which have since been sheltered in the Arboretum Nursery, will be put out in a clearing in the woods near the Larch collection, and it is hoped to establish even the less hardy species under a shelter wood.

The very severe winter eather seemed to encourage the alpine tropical species to give of their best when the frost and snow were succeeded by spring and summer. This was particularly noticeable in the Rhododendron Dell and Azalea Garden where flowering lasted much longer than usual, while the display of dwarf Rhododendrons near King William's Temple lasted many weeks.

A very valuable addition to the collections was received in April, 1947, from the United States Department of Agriculture, who sent a number of species of *Arundinaria*, *Bambusa* and *Phyllostachys*. Most of the specimens arrived in good condition and are being established in the nursery prior to planting in the Bamboo Garden.

The demonstration area devoted to the cultivation of vegetables was maintained and continued to make very considerable demands on the labour available. The yields as usual were good.

Alpine and Herbaceous Department.

An increase in the number of Students and Trainees provided a welcome increase in labour which was devoted in part to the reconstruction of the northwest corner of the Rock Garden. At the other end of the garden several large Holly trees were removed and will be replaced by some of the better varieties of Rhododendrons, in whose shade it is hoped to grow species of shade loving *Lilium*, *Primula* and *Meconopsis*.

The Alpine House again attracted much attention and the display of Crocuses and Tulips and other bulbous plants in the early spring was much admired.

In the Iris Garden the plants came into flower during a very hot spell and despite watering, the display was over within a week. Some of the beds have been enlarged, and the soil in others has been renewed ; some better varieties have been planted out, and it is hoped that the display in 1948 will be better than in 1947.

During the year a number of new varieties of hardy *Nymphaeas* were presented and these have been added to the existing collection in the Aquatic Garden. The Chalk Garden continues to progress and several new British plants were added during the season.

Seeds and plants received during the year included a collection of seed from Mr. Rex Pearce, California, seeds collected by Capt. F. Kingdon-Ward in the Khasi Hills, and by Mr. Peter Davis in Western Anatolia, a large collection of species of *Primula* from the R.H.S. Gardens, Wisley, a miscellaneous collection of plants from Edinburgh Botanic Gardens and a number of uncommon British plants collected in the Scottish Highlands by Mr. P. Benton.

Decorative Department

Many of the spring bedding plants such as Wallflowers, Violas and Alyssum were killed by the exceptionally hard winter, but the tulips

provided a considerable show of colour later on. Despite the continually hot and dry conditions most of the summer bedding plants flowered well throughout the season, the Korean Chrysanthemums in particular flowering well into November. A supply of Gladiolus from Holland enabled this attractive plant to be displayed again after its wartime absence.

Some of the better and more decorative Dahlias were attacked and destroyed by a virus disease. A nucleus of a new stock has been started and the old Dahlia border was sown with single Asters which gave a very fine display. The Rose Garden did well particularly towards late summer when the cool nights enabled the flowers to last over longer periods. Aphis was numerous but mildew was not so prevalent as usual.

Tropical Department
Palm House

Considerable work was carried out during the year particularly on the Banana bed, which was given new soil and a number of suckers put out to replace the older plants which had fruited the previous year.

Ferneries

In House number 1 the main beds were filled with a specially prepared compost and many of the larger ferns were moved there in order that they might have more room for their development. In House number 5 the two small rockery beds in the centre were replanted, one half being devoted to Aloes and the other chiefly to Euphorbias. The Agaves were for the most part repotted during the year. A very valuable collection of succulents which had been presented to Their Majesties during the Royal Tour of South Africa, was given by Them to the Gardens. A further collection of succulents were sent by the South African Institute of Parks Administration.

T. Range

Much work was done on the Nepenthes and Insectivorous Houses, where the beds were provided with new soil or a compost of peat and sphagnam. The plants, especially the species of *Drosera*, *Pinguicula* and *Sarracenia*, benefitted considerably from the improved conditions.

A large exhibit of Stove and Greenhouse plants was awarded a Gold Medal at the Chelsea Show.

Large quantities of surplus material were distributed to Botanic Gardens and Scientific Institutions throughout the country.

Temperate Department

The extraordinarily hot dry summer suited the Australian, New Zealand and South African collections and they took full advantage of it. The results of this favourable season will be seen mainly in 1948. The Australian Acacias in particular did well and many of the species were covered with flower buds at the end of the season and gave great promise for the following year. The rare half succulent South African plant, *Greyia sutherlandii*, produced a magnificent inflorescence of brilliant scarlet flowers as if to show how it appreciated the favourable conditions.

Several of the large older Palms have flowered and fruited freely, and some of the Howeas have produced seed regularly now for a large number of years. The fruits of both *Howea belmoreana* and *H. forsteriana* have the extraordinary character of remaining on the old inflorescence for a period of ten or more years, and during this time they still remain green. Amongst the interesting New Zealand plants two large Palms, *Rhopalostylis baueri* and *R. sapida*, also fruit regularly and they are remarkable because the fruits turn a bright coral red on ripening, and these remain for some months on the inflorescence. An unusually tall specimen of the South European Fan Palm, *Chamaerops humilis*, has fruited this year.

Camellias as usual did well and the genus is becoming very popular for the greenhouse or for use in sheltered spots in the open in many gardens. The best of them all is *Camellia reticulata* (the specimen at Kew must be nearly 100 years old) which was covered during the season with a great mass of rose-red flowers.

The Museums

An important rearrangement of specimens has been made in No. 1 Museum. It has long been felt that a systematic arrangement according to a natural system possesses drawbacks where the general or visiting public is concerned, and that specimens displayed according to subject or uses are likely to have a greater appeal. Some eighteen cases on the ground floor were cleared of existing specimens early in the year and other selected specimens representing all the main groups of economic plants substituted. Different exhibition cases are now devoted to—food plants, fodder plants, beverage plants, fruits and nuts, oils, spices, fibre plants, medicinal plants, rubber, tans and dyes, gums and resins etc. It is intended to extend this collection of special exhibits when more space becomes available for housing the specimens removed. These may in time constitute essentially a reference or working collection.

The North Gallery, which suffered damage during the war, still remains closed, but it is hoped that in the near future the unique collection of paintings of flowers, housed in this building, will again be on view.

Among donations received during the year one of the most outstanding was a valuable collection of timbers (mainly hardwoods) from the Worshipful Company of Turners. These are selected hand specimens in a specially made draw-cabinet.

The advisory and identification work of the Department has followed much the same lines as previous years with perhaps a notable increase in questions relating to fibres, a subject which has received special attention from one of the staff during the year.

Interest in the cultivation of medicinal plants has been maintained.

Jodrell Laboratory

In comparison with previous years there was a considerable increase in the number of samples received for identification by microscopical methods. Most of the material submitted consisted of wood specimens, of which some enquirers sent as many as 12 samples at a time. The

timbers concerned had been obtained from many different parts of the world, but included a high proportion from tropical Africa, S. America and Australia. A number of timber specimens from their reference collections were identified on behalf of the Forensic Science Laboratory, Wakefield, Yorks, and numerous small fragments of wood for mycologists on the respective staffs of the Kew Herbarium and the Commonwealth Mycological Institute. Fragments of charcoal, of archaeological interest, were also received for identification.

A number of samples of portions of plants used in medicine were received for the detection of adulterants or substitutes. In this connection it was repeatedly found that subterranean portions of *Elephantopus scaber* Linn. were substituted for Indian Podophyllum root (*Podophyllum hexandrum* Royle). Fragments of Indian Lobelia herb were identified as derived from *Lobelia excelsa* Lesh., whilst fragments of the leaves of a S. American plant with reputed medicinal properties were found to be those of *Antonia ovata* Pohl. (Family Loganiaceae).

Problems connected with the identification of fragments of seeds in cattle cake as usual presented great difficulties, especially when it was necessary to distinguish between the seeds of different species of *Brassica*. In one instance a sample of crushed cattle cake described as " Linseed Screenings Meal " was found to consist mostly of charlock, with an admixture of Linseed, Soy Beans and other miscellaneous items.

The roots of various trees that were alleged to have grown below and weakened the foundations of certain buildings were examined on behalf of architects, and mostly identified as Elm, although other trees were also involved.

After devoting considerable time to its final revision and to the preparation of a bibliography of over 2,000 titles, the new reference book entitled " The Anatomy of the Dicotyledons," written by the Assistant Keeper in collaboration with Dr. L. Chalk of the Imperial Forestry Institute, Oxford, was almost ready to go to press by the end of the year. In connection with this work, Dr. Chalk was a frequent visitor to the laboratory, and much valuable assistance was provided by Miss E. M. Slatter.

The Assistant Keeper continued to attend meetings of the pharmacognosy sub-committee of the Codex revision committee set up by the Pharmaceutical Society of Gt. Britain to revise the British Pharmaceutical Codex. Numerous drafts of monographs for and proofs of portions of the forthcoming revised edition were also received for correction at intervals throughout the year. The Assistant Keeper also served on the Library Committee of the Linnean Society.

Miss Slatter continued her work on raising irises by removing embryos aseptically from seeds and growing them, in their early stages, on agar cultures containing mineral nutrients. Many seedlings raised in this way were successfully transferred to suitable potting composts in which they were grown until mature. Further investigations will, however, be necessary before repeated success is assured.

Dr. E. K. Janaki Amal (Wisley), Dr. G. R. Lane (University College

Southampton) and Mrs. Jameel (Westfield College) made use of the laboratory to fix cytological material.

Leopold Portheim, a co-director and co-founder of the Biological Institute of the Academy of Sciences in Vienna, who had worked at the Jodrell Laboratory almost continuously since the beginning of 1939, died in the spring of 1947 after being seriously ill for some time.

Economist Botanist

Sir Geoffrey Evans, C.I.E., the Economist Botanist, was deputed early in the year to represent the Director on the Imperial War Graves Commission, in order to report on the War Cemeteries in Italy. He was away for six weeks, and on his return submitted a detailed set of proposals to the Commission.

In the spring he was asked by the Secretary of State for the Colonies to become Chairman of a Commission appointed to enquire into the possibility of settling surplus populations from the British West Indian Islands and also displaced persons from Europe on the mainland colonies of British Guiana and British Honduras. This entailed a visit of six months to these two colonies and to the islands of the British West Indies. At the close of the year he was still engaged in preparing his report which will be presented to Parliament.

Publications.

A considerable number of papers, additional to those recorded below, have been completed and sent to press. Unfortunately, their publication has been delayed by circumstances outside the authors' control. Articles published in Hooker's Icones Plantarum 5th ser. **5,** Part III (1947) are not listed separately below.

W. B. Turrill : The teaching of taxonomy. Proc. Linn. Soc. **159,** 66 (1947).

E. M. Marsden-Jones and W. B. Turrill : Researches on *Silene maritima* and *S. vulgaris* XXVI. *K.B.* 1946, 97 (1947).

A quantitative study of petal size and shape in *Saxifraga granulata* L. Journ. Genetics **48,** 206 (1947).

E. M. Wakefield : Edible and Poisonous Fungi, Min. Agric. and Fisheries, Bull. 23. ed. 2.

N. Y. Sandwith : Two new Leguminous trees of British Guiana, Contrib. Gray. Herb. **165,** 25 (1947).

On the identity of the genera *Cupulissa* Raf. and *Platolaria* Raf. (with E. D. Merrill), Journ. Arn. Arb. **28** : 430 (1947).

Bayonia Dugand, a superfluous generic name, *K.B.* 1946, 87 (1947).

E. Milne-Redhead : Tropical African Plants : XIX. *K.B.* 1947, 23.

A probable natural hybrid in *Hymenocardia* Tul. *K.B.* 1947, 46.

Cerastium brachypetalum Pers. in Britain. The Naturalist, 1947, 95.

H. K. A. Shaw : On *Cirsium lanceolatum* Hill and *C. lanceolatum* (L.) Scop.—*Not. Syst.* **13** (1–2), 55 (1947).

Notes on the genus *Gonystylus* Teijsm. et Binnend. (*Thymelaeaceae*). *K.B.* 1947 (1), 9 (1947).

The genus *Fissipetalum* Merr. *K.B.* l.c. 22.

Typification of new names derived from persons or places. *K.B.* l.c. 35.

The botanical name of the wild tetraploid watercress. *K.B.* l.c. 39.

B. L. Burtt : The species of *Saintpaulia*. Gard. Chron. 3rd. ser. **122**, 28 (1947).

Corallodiscus and *Didissandra* l.c. 122, 104, 112 (1947).

R. Melville : The nutritive value of nuts. Chemistry and Industry No. 22, 1947, 304, 306.

Flowering trees and shrubs as suburban bee pasturage. Proc. & Rep. British Beekeepers' Association 1946, 39-43.

R. Melville and M. Pyke : The effect of specific variability and the environment on the vitamin C content of British rose hips. Proc. Linn. Soc. 159 (1), 1947, 5–16.

Assistant Director

Dr. N. L. Bor, C.I.E., M.A., D.Sc., F.R.S.E., has been appointed Assistant Director and took up his duties on the 5th May, 1948.

After taking part in the first World War, Dr. Bor entered the Indian Forest Service in 1921. In India he occupied many administrative posts including that of the Political Officer, Balipara Frontier Tract, Deputy Commissioner of the Naga Hills and Forest Botanist at the Forest Research Institute, Dehra Dun. In 1942, after the entry of Japan into the war, he returned to his old province, Assam, to take up administrative work relating to the raising of coolie corps and the evacuation of civilians from Burma. From 1944–1946 he was in charge of the organisation which dealt with the reconstruction and rehabilitation of the Naga Hills and Manipur State after the Japanese invaders had been driven back. He retired from the Indian Forest Service in 1946.

Dr. Bor's botanical interests are the taxonomy of Indian plants, in particular the Gramineae, and the synecology of Assam, the Himalaya and the Nilgiris. He was President, Botany Section, Indian Science Congress in 1942, and President of the Indian Botanical Society in 1943. He has published some forty papers on his own subjects.

CLASSIFICATION OF THE BANANAS

E. E. Cheesman.
Imperial College of Tropical Agriculture.

III. Critical Notes on Species.

a. M. balbisiana *Colla*, Mem. Gen. Musa. 56 (1820).

This species, judged by the frequency with which it has come into the *Musa* collection at the Imperial College of Tropical Agriculture, is the commonest and most widely distributed of all *Musa* species. Its name, however, has never had general currency since Colla bestowed it, and among other preliminaries to a revision of the genus to which it belongs some discussion of nomenclature is desirable.

The original description is in *Memorie dell' accademia reale delle scienze di Torino*, Tomo XXV, but the article in which it occurs was apparently reprinted, with change of pagination, as *Memoria sul genere Musa*, and the usual citation in the literature is that given above. It is the reprint, and not the original edition, that I have seen and transcribe as follows :

1. Musa balbisiana. M. spadice nutante, corde progerminante, floribus sterilibus et masculis deciduis, fructu semper virente polygono dorsis inaequalis. N.

M. Troglodytarum var. β. W. sp. 11 p. 894. M. XI *pissang batu, seu pissang bidii* ; Rumph. Amb. p. 132 t. 60 fig. f. quoad fructum et semina.

An bananier Cro-batu Desv. pag. 33 n. 17 ?

Habitat in India orientali.

Haec est vera species, non varietas *M. uranoscopus* Rumphii : gerit quidem semina uti observavit W. ; sed spadix nutans, non erectus, ut in *uranoscopo* ; cor spadicis progerminans in hac stirpe brevis est, ac crassius quam in reliquis : fructus irregulariter angulosus, protuberantibus dorsis inaequalis, externe semper virens : pulpa mucosa, sed dulcis ac mollis, totaque repleta ossiculis duris, et nigricantibus instar Paeoniae seminum ; per surculos adeo multiplicatur, ut intra breve temporis spatium magnum occupet locum ; fructus raro eduntur crudi, sed torrentur ad usum medicum. Hanc speciem dixi in honorem egregii Doctoris Balbis, olim in nostro Athenaeo materiae medicae et botanicae Professoris, nunc horti Lugdunensis Praefecti, qui primus asseruit speciem in Regio Horti botanico cultam sub nomine M. paradisiacae esse forsan M. sapientum.

It will be noted that Colla bases his species quite definitely on " Musa XI, *pissang batu* " of Rumphius. This is one of the seventeen varieties of bananas listed by Rumphius in Herbarium Amboinense (1750) under the heading " Musa sativa seu domestica " with this description :

" 11. P. Batu, seu P. Bidji quoad formam cum praecedenti convenit, sed non adeo crassus est, at rotundior, externe semper virens, caro ejus interna mucosa quoque est, sed dulcis ac mollis, totaque repleta ossiculis duris, et nigricantibus instar Paeoniae seminum, quae inter edendum exsugenda sunt, raro autem crudi eduntur hi fructus, sed torrentur ad

usum Medicum. Ejus stipes altus est rami ac folia viridia, atque per prolem seu surculos adeo multiplicatur, ut intra breve temporis s patium magnum occupet locum."

" Pisang batu " means stone banana (referring to the seeds) and is a name in use down to the present day in Malaya and the East Indies (cf. Howes in *Kew Bull.* 1928, p. 323) for what is clearly the fruit described by Rumphius. In fact, of all the species and varieties described in *Herbarium Amboinense* this is the easiest to identify with confidence.

Its first appearance in the literature after 1753 is in the second edition of *Species Plantarum* (1763), where Linnaeus added *Musa troglodytarum* to the three species (*paradisiaca*, *sapientum* and *bihai*) previously named by himself, with this diagnosis :

" 4. Musa spadice erecto, spathis deciduis. Musa uranoscopus Rumph. amb. 5 p. 137 t. 61 β. Musa XI Pissang Batu. Rumph. amb. 5 p. 132. Habitat in Moluccis. Haec gerit semina multa, ideoque ab autoptis fructificatio attente inquirenda."

The lumping together of " Musa uranoscopus " which *has* an erect inflorescence with " Pisang Batu " which *has not* is an astounding piece of work, only explicable on the assumption that Linnaeus was obsessed by the occurrence of seeds as a specific character and thought there could only be one seeded species. But Linnaeus's treatment of Rumphius is beyond understanding in other ways, for having obviously referred to the Herbarium Amboinense he completely ignored the other seeded species (*M. alphurica*, *M. simiarum* and *M. silvestris*) described in later chapters. For present purposes, however, the important point is that *Musa troglodytarum* L. refers primarily to *Musa uranoscopus* of Rumphius and is not a valid name for Pisang Batu. Willdenow, in the fourth edition of *Species Plantarum* (1806), copied the second edition and likewise provided no name for the speices.

Loureiro in *Flora Cochinchinensis* (1790) described a " species " as *Musa seminifera* which includes this form, but again it is confused with another—in this case with Rumpf's " Pissang Utan "—and the name is not valid for Pisang Batu.

Roxburgh in *Hortus Bengalensis* (1814) mentioned the species as it occurs in India as " *M. sapientum*, the wild sort " and in his *Plants of the Coast of Coromandel* (1819), t. 275, figured the flowers and fruit. Later (in his *Flora Indica*, 1824) he gave the first detailed description of it, still distinguishing it as the " wild sort " under *M. sapientum*. It is chiefly as a variety of *M. sapientum* that this species has been known ever since.

Colla was clearly the first to recognize Pisang Batu as a good species, distinct from any previously described, and although his name has been so generally ignored it seems to be the valid one.

Curiously enough, the only earlier name which presents any serious claims to consideration is *Musa rosacea* Jacq. This name (dating from 1804) has been almost universally misapplied to *M. ornata* Roxb. since 1822, and if it now had to be applied in accordance with the rules of priority to an entirely different but even more widespread species the

M. balbisiana Colla. Clone Ceylon.

1. Two male buds in advanced blooming, showing how the bracts may be either persistent or deciduous.

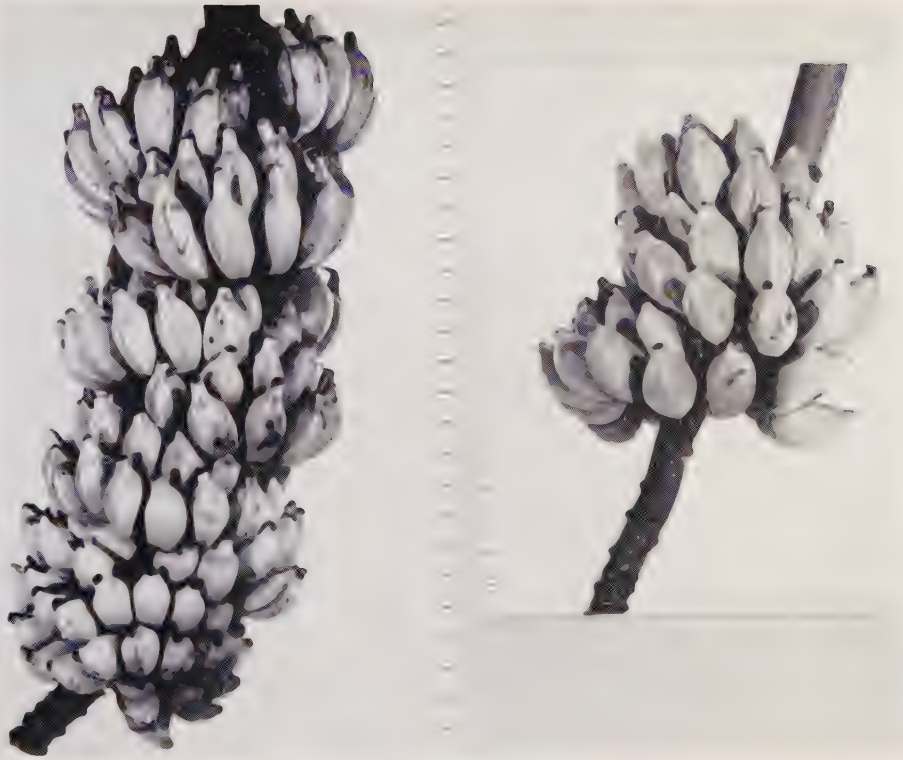
2. Males bud showing the lifting of several bracts at once, characteristic of the species.

3. Upper part of pseudostem, showing the close clasping habit of the non-scarious petiole margins.

Scale in inches in all figures.

Photographs by K. S. Dodds.

[*To face page* 12.



M. balbisiana Colla.

Fruit bunches. The large bunch (Fig. 1) happens to be from an Assam plant and the smaller (Fig. 2) from Clone Ceylon : but a similar range of size is found within the Clone.

Scale in inches in all figures.

Photographs by K. S. Dodds.

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confusion would be horrible. There is not the slightest doubt that Jacquin's plant was very closely related to *M. balbisiana*, and but for one saving circumstance we should be obliged to regard *M. balbisiana* as a synonym of *M. rosacea*. The saving circumstance is that *M. rosacea* was apparently a seedless banana. As such, we may regard it as probably polyploid and possibly hybrid in constitution, and so avoid admitting its identity with any seeded species. The argument is expedient rather than strictly honest, but it receives some support from the illustration of the fruit of *M. rosacea* in Jacquin's *Fragmenta Botanica* (t. 132, fig. 4). This fruit is rather distinct from that of the typical seeded *M. balbisiana*, and suggests that *M. rosacea* may possibly have been a variety of mixed specific origins. *M. bakeri* Hook. f. is another plant of this affinity, apparently also cultivated and seedless : this name, however, does not affect the nomenclatural discussion as it dates only from 1898.

The reason why Roxburgh's attribution of the species to *M. sapientum* cannot be accepted is the same as that for the rejection of *M. rosacea*. *M. sapientum* L. is the most confounded and confusing combination in the whole literature of *Musa* and will have to be discussed separately, but some reference to it here is unavoidable. The name was quite definitely used by Linnaeus for cultivated bananas, but it is not so clear whether he had one particular variety alone in mind, or whether he realized that there were several and intended the name to cover all. Assuming that he had only one variety in mind, it was that depicted by certain drawings in Ehret's *Plantae Selectae* which he cited. That variety happens to be a dessert banana of a group which we have good reason to believe is of hybrid origin. Consequently it is extremely unsafe and undesirable, in the present state of knowledge, to regard any wild and fertile *Musa* as a wild form of *M. sapientum* : there is probably no such thing.

The worst feature of the confusion between *M. balbisiana* Colla and *M. sapientum* L. is that there is an oblique connexion between them which cannot be ignored. The truth is that the cultivated and seedless bananas and plantains of India and Malaysia are closely related to, and probably derived from, two distinct species of *Musa*. More precisely, available evidence indicates that at least two species are involved and does not indicate more than two. Some cultivated varieties are more clearly related to the one species and some to the other, and there is a third group which combines prominent characters of both species and includes *M. sapientum* L. *sensu stricto*. *M. balbisiana* is one of the two ; hence its great importance to the banana breeder and the need for its clear definition.

Roxburgh noted in India both a numerous array of cultivated banana varieties and a wild plant that he thought was the parent of them all. He failed to notice that the cultivated forms were divisible into two or three groups, and that his wild plant was closely related to only one group. Thus, regarding all bananas as *M. sapientum*, he naturally called his wild species by the same name.

Later on, Kurz (*Journ. Agric. Hort. Soc. India* **14,** 295–301 : 1865–66) did notice that bananas were divisible into groups of different

specific origins, and restricted the name *Musa sapientum*, but still applied it *sensu* Roxburgh and not *sensu* Linnaeus.

J. G. Baker (*Ann. Bot.* **7**, 213 : 1893) did nothing to reduce the confusion when he listed *M. seminifera* Lour. as a subspecies of *M. sapientum* L. and gave *M. sapientum* Roxb. and *M. balbisiana* Colla as synonyms of *M. seminifera*. Most subsequent authors follow Baker.

Backer (*Handboek voor de Flora van Java* **3**, 135 : 1924) described the species as new, under the name *Musa brachycarpa*. His oversight or rejection of Colla's name (which he does not mention) is surprising in view of his footnote, which reads (my translation) :

> A banana (Pisang batoe—Pisang kloetock—Tjaoe kelele—Tjaoe kloetock) not infrequently grown for its leaves, used as packing material, is very closely related to *M. brachycarpa* and bears in the same way fruit full of seeds. It differs only in the following respects ; Female hands 4–7, of 7–13 flowers. Fruit slenderer than in *M. brachycarpa*, 10–16 cm. long, 3½–5 cm. thick. These differences are of very little systematic value.

To complete the muddle surrounding its identity, *M. balbisiana* has been confused with various other species, especially the entirely different *M. textilis* Née,—apparently because a variety of it is grown in the Philippines for fibre, though inferior to the true *abaca*, *M. textilis*. Plants grown in the *Musa* collection at the Imperial College of Tropical Agriculture which have turned out to be *M. balbisiana* have been variously labelled on receipt " M. textilis ", " M. Basjoo ", " M. Cliffortiana ", " M. rhodochlamys " and " M. Martini ". We retain 18 clones as evidence of its wide distribution from Ceylon through India and Malaysia to the Philippines and New Guinea, and of its occurrence under misleading labels in several botanic gardens.

M. balbisiana is a strikingly distinct species in many respects and varies surprisingly little, considering its wide range. Variation there is, especially in fruit characters, but nothing like the variation shown by another ranging species, *M. acuminata* Colla. The plant is one of the biggest in the genus, and its wide distribution possibly depends in part on its vigour and apparently very high resistance to pests and diseases. We find it the easiest of all the species to grow, and from the banana breeder's point of view it is unfortunate that the dessert bananas in general are not of its close affinity, and that *M. balbisiana* does not combine at all well with them.

One of its most constant characters is its unflattened, almost globose, minutely warty seed. Among dozens of seed samples received in Trinidad we have never seen anything else like it, though the local races vary a little in size and markings. The same kind of seed is found in those edible bananas which are believed to be derived from *M. balbisiana*, when they are made to set seed by suitable pollination. Most dessert bananas have an entirely different seed.

To facilitate recognition of the species I give here a summary of its synonymy, a generalized description, and notes on distribution :

Musa balbisiana *Colla*, Mem. Gen. Musa. 56 (1820).

Calem-Bala Rheede Hort. Malab. 20 (1686).

Musa XI Pissang batu seu pissang bidii Rumph. Herb. Amb. **5,** 132, t. 60 fig. f. (1750).

Musa troglodytarum Linn. Sp. Pl. ed. II. 1478 *p.p.* (1763).

Musa seminifera Lour. Fl. Cochinch. 644 *p.p.* (1790).

Musa sapientum L. (" *the wild sort* ", *sensu* Roxb. Hort. Beng. 19 (1814) ; Corom. Pl. t. 275 (1819) ; Fl. Ind. **2,** 484 (1824) et ed. 2. 663 (1832) ; *non L.*

Musa sapientum L. *sec.* Miq. Fl. Ind. Bat. 587 (1855) *p.p. quoad Pisang bidji* ; *sec.* Kurz. in Journ. Agric. Hort. Soc. India **14,** 295–301 (1865–66) *p.p. excl. syn. M. paradisiaca* ; *non L.*

Musa paradisiaca L. *sec.* Trimen, Flora of Ceylon **4,** 265 (1898) ; *non L.*

Musa brachycarpa Backer in Handb. Flora van Java, Afl. 3. p. 134 (1924).

Plant stooling freely ; pseudostems robust, up to more than 6 metres high, commonly at least 30 cm. in diameter at base, predominantly green or yellowish green, the upper parts of the leaf-sheaths often with black markings and the lower parts in age often light reddish brown ; leaf-sheaths and petioles usually more or less glaucous or pruinose, sometimes heavily so.

Leaf blades oblong, up to more than 3 m. long, 60 cm. wide, truncate at apex, rounded or slightly cordate at base, green above, paler and more or less glaucous beneath, midribs green or yellowish green ; petioles 60 cm. long or longer, strongly concave above, their edges almost meeting over the adaxial channel, margins inconspicuous above, more developed below, where the petiole passes into the leaf-sheath, here closely appressed to the pseudostem, not becoming scarious, often bordered by a black line. *Inflorescence* pendulous, its peduncle and rachis glabrous ; basal flowers female, the number of female hands varying up to about 10 (10–15 *fide* Backer) ; upper hands male. *Male bud* in advanced blooming broadly ovoid to ellipsoidal, the bracts imbricate at the blunt apex. *Bracts* various shades of purple, broadly ovate, rounded at apex, often greenish or yellow at extreme tip ; outer surface more or less glaucous, usually longitudinally ribbed, inner surface dark crimson to the base, transversely corrugated between the ribs ; several bracts lifted at the same time, exposing several hands of male flowers simultaneously ; bracts usually soon deciduous after flowering but occasionally persistent in a withered condition, especially in the later stages of blooming. *Male flowers* about 20 per bract, in two rows ; compound tepal 4–5 cm. long, about 1·2 cm. wide, whitish in ground colour but commonly more or less purplish within, the pigmentation varying from a pale blotch at the base of the tepal to bright reddish purple over most of its length, and showing through to the outside as a pink tinge ; upper part of tepal, including the teeth, yellow, varying from pale yellow to rather dark orange, the teeth about 5 mm. long, the 2 outer with a dorsal filiform appendage 1–2 mm. long ; free tepal about half as long as the compound tepal, translucent white or pinkish, more or less boat-shaped, obtuse, truncate, or emarginate at apex, with a short mucronate apicula ; stamens at first as long as the perianth, later exserted. *Fruit bunch* pendent

very compact, the crowded fruits having little room (except in the basal hand) to reflex geotropically, and consequently for the most part standing out from the rachis. *Individual fruit* about 10 cm. long (7–15 cm. *Backer*), 4 cm. in diameter, distinctly angulate at maturity, rather abruptly narrowed at base into a pedicel of 1–2 cm., and more gradually at apex into a short broad acumen ; pericarp about 3 mm. thick, pale yellow at full ripeness, soon blackening ; pulp whitish. *Seeds* black, irregularly globose, scarcely depressed, minutely warty, 5–6 mm. across and 4–5 mm. high.

Distribution : Ceylon, India, Burma, Siam, Malaya, Java, Philippines, New Guinea.

In Ceylon this is apparently the only species of *Musa* that occurs wild. It is listed in Trimen's Flora Vol. IV p. 265 as *M. paradisiaca*. I.C.T.A. received in 1930 three packets of seeds from the Department of Agriculture, Ceylon, collected in three different districts, as " wild plantain ", with the Sinhalese names *eti-kehel*, *eta-kehel* or *ati-kehel*. All the plants raised were alike, and one clone (I.R. 100) is retained as Clone Ceylon.

From Southern India we have living material from Mysore (I.R. 50, Mysore Seeded, and I.R. 71, Yella Bale) and Madras (I.R. 134, Ginjali Arati). Among Indian material in the Kew Herbarium, I refer here *J. S. Gamble* 7482, Gt. Rangit Valley, Darjeeling, Dec. 1879, and *J. S. Gamble* 27146, Dehra Dun, 2,200 ft., Aug. '98. Also sheets marked " 4. Musa Sikkim (Herbarium Hookerianum) Wild Banana of Hot Valleys, Sikkim ", and " 5. Musa Sikkim (Herb. Hooker.) " ; but there is some confusion about the Sikkim species, because drawings in the Kew collection with similar labels depict entirely different plants, with large, flattened, angular seeds nothing like those of the specimens cited. The drawings possibly correspond to Dr. King's varieties *hookeri* and *thomsoni*, mentioned by J. G. Baker (1893, p. 214), but this problem needs further study ; they also appear to represent a form or forms having affinities with *M. nagensium* Prain. Dr. King's variety *pruinosa* is almost certainly referable to *M. balbisiana* : in our collection I.R. 120 received from the Royal Botanic Garden, Calcutta, as " Raling kurdong of the Lepchas ", was certainly this species, but the plant has died. From Assam we have I.R. 214 from Central Range, Gologhat, and I.R. 242, locality unspecified.

From Burma, *Parkinson* 1760, 24.11.28., Myitkyina Distr., Tagwin chaung, 400 ft. (in Herb. Kew.), is doubtless the same as our I.R. 186 (Tagwin) from the same district. This specimen had been determined by C. E. C. Fischer in *Kew Bull.* 1931, p. 28, as *M. paradisiaca* L. var *pruinosa* King.

As evidence of the occurrence of *M. balbisiana* in Siam we have Howes's description and figure of *Klui tani* in *Kew Bull.* 1928, p. 323, and a specimen in Dr. A. F. G. Kerr's collection : *Kerr* 6743, Bangkok, 4 February, 1923. In Malaya the species is represented by *Pisang batu* (Howes *l.c.*). In Java it is recorded by Backer as *M. brachycarpa* and we have living material of this (I.R. 83. Clone Brachycarpa) from seeds received from the Botanic Garden, Buitenzorg, as well as I.R. 82 received from the same source as " *M. cliffortiana* L.".

From the Philippines we have I.R. 80 (Butuhan) received as " *Musa errans* Blanco, variety Butuhan " and I.R. 81 (Pelipia) received as " *Musa sapientum* L. variety Pelipia ". There is also plenty of evidence in the literature of the widespread occurrence of *M. balbisiana* in the Philippines.

Our knowledge of the distribution was extended to New Guinea by receipt of I.R. 198 (Madang), collected at Warai beach village, Rai Coast, Madang District, and sent with several other valuable contributions by G. H. Murray, Esq., Director of Agriculture, Rabaul, in 1938.

CLASSIFICATION OF THE BANANAS

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III. Critical Notes on Species.

b. M. acuminata *Colla*, Mem. Gen. Musa 66 (1820).

The species to be discussed under this name is the most important in the genus to the banana breeder, being the closest wild relative known of most Malaysian dessert bananas and also of the commonest plantains. It is second in breadth of range to *M. balbisiana* Colla, but surpasses that species in variability, and like it has a complicated history in the literature.

Our observations over several years of wild bananas from Malaya, Java, Burma and Indo-China indicate the existence of a genetically complex but interbreeding population which must either be treated as a single taxonomic unit or divided into an inconveniently large number tending to intergrade. C. A. Backer (*Flora van Java* **3,** 136 : 1924) says of the species (which he calls *M. zebrina* Van Houtte) that it is polymorphic, occurring in Java in a great number of forms, which might be considered as species, were they not connected by every grade of transitional form which makes any sharp definition of species impossible. We have less information about transitional forms on the Asiatic mainland, but have found by breeding experiments that forms of sufficiently distinct appearance to pass in the field as separate species may be completely interfertile and give a perfectly intergrading progeny. From this we conclude that more extensive collection would be very likely to produce links between the most extreme forms in the assemblage.

The evidence of the I.C.T.A. collection, and all the other information I have been able to gather, also suggest that there is only one such large and variable species common over the region mentioned and answering to one general description. This and the very distinct *M. balbisiana* are the two commonly occurring wild species of *Eumusa*, and between them account for a large proportion of the numerous forms that have been described. Other species of *Eumusa* occurring in the same range, when they have been recognized and defined, present simpler problems, being apparently more localized and differing from *M. acuminata* in characters more fundamental than those that vary within that species.

The choice of the name *M. acuminata* Colla for this important taxonomic unit depends on the identification of a Rumphian type, which must always be a matter of opinion and subject to criticism. Colla's description is as follows :

9. Musa acuminata. M. spadice subnutante, floribus sterilibus et masculis deciduis, foliis longe petiolatis undulatis, fructu sub-cylindraceo acuminato. N.

M. simiarum pissang Jacki Rumph. Amb. pag. 138 t. 61 fig. 1.
Bananier de Jacki Desv. pag. 43 n. 40.
Habitat in Amboinae sylvis

Convenit cum Musa sylvestri 3 ratione spadicis qui tantum subnutans et fere horizontalis, sed differt quoad foliae quae longe petiolata margineque undulata, et quoad fructum qui nec polygonus, nec nigricans, sed fere cylindricus, apice angustatus : est praeterea species asperma quamvis sylvestris.

Convenit quoque cum Musa Uranoscopus 4 ratione foliorum, sed hujus spadix erectus, nec subnutans, fructus irregularis, et semina gerens : caeterum ab omnibus distat magnitudine, namque ex Rumph " truncum, ac fructus gerit multo minores : fructus binorum articulorum digiti longitudinem habent uniusque latitudinem, fere rotundi, arcte sibi adcumbunt, atque superius acuminati sunt ; ab hominibus plerumque negliguntur ac simiis cibo relinquuntur ". unde *M. simiarum* dicta.

Hanc speciem *acuminatam* potius quam *simiarum* appellavi ut indicarem quomodo ipsa fructum *acuminatum* gerat.

For the basis of this description we have to go back to Herbarium Amboinense (1750) where the relevant text is this :

" Verae Musae silvestris binas observavi species, magnam et parvam: Parvam quae hisce in terram vulgatissima est, primo describam. Atque haec truncum ac fructus gerit multo minores omnibus domesticis speciebus, vel saltem instar illorum Pissang Keker. Ejus enim fructus binorum articulorum digiti longitudinem habent, uniusque latitudinem, fere rotundi, seu parum angulosi. Ipsorum medulla est instar Pissang Medji, nulla continens granula, saporis dulcis, cortex vero difficulter separatur. Hi vero fructus arcte sibi adcumbunt, atque superius acuminati sunt, instar Pissang Djarong. Nomen. Latine *M. simiarum*, Malaice *Jacki*, h.e. Simiarum Pissang. Amboinice *Kula Bey*, Baleyice *Buo Lutton*, quod nomen ipsis etiam habet *P. Canaya*. *Locus*. In Amboinae silvis obcurrit, sed raro reperitur. *Usus*. Quum ejus fructus bene sint maturi, crudi edi possunt, sed ab hominibus plerumque negliguntur, ac Simiis & Cercopithecis cibo relinquuntur in insulis, in quibus obcurrunt, qualis est Baleya etc.".

Accompanying this text is a drawing (t. 61, fig. 1) which is rather crude, but agrees sufficiently well with our species. Description and figure together fit no other species recognized by later authors and do fit ours, with one important discrepancy—Rumphius states that his plant was seedless, whereas our species is usually fully fertile.

Colla almost certainly had nothing but Rumphius's description and figure in his mind when he renamed the species. It is extremely unlikely that he had seen the plant, and nobody else seems to have mentioned it between 1750 and 1820 (except Desvaux, whose treatment of it does not affect the nomenclature, as he regarded almost all *Musa* spp. as varieties of *M. paradisiaca*). As *M. simiarum* is " pre-Linnean " and had not been taken up, Colla's name must be accepted, but the description is entirely due to Rumphius.

Kurz (*Journ. Agric. Hort. Soc. India* **14,** 297 : 1865–66) used the name " *M. simiarum* Rumph." to cover an assemblage of wild and cultivated, seeded and seedless forms. He distinguished four varieties, a. *sylvestris*, b. *violacea*, c. *culta* and d. *corniculata*, and to the first he added as a synonym *M. acuminata* Coll., though he went on to say " fruits . . . . full of seeds ". In his later paper (1878) he apparently intended to substitute the name *acuminata* for *simiarum*, for he refers to " *M. corniculata* " as " a monstrous variety of *M. acuminata* ", but the paper is incomplete and the exact arrangement which he was adopting is somewhat obscure.

There can be no doubt that Kurz's varieties a. *sylvestris* and b. *violacea* were forms of the polymorphic species now under discussion. He says : " This kind . . . . is found in great quantity not only in the hilly parts, where it forms with several large Elettarias a marked zone of vegetation but also in the lower moister parts throughout the Malayan Archipelago, the Moluccas and Malacca." Later on he has : " I have noted about 6–8 varieties, mostly differing in colour of the leaves and fruits as also by the greater or lesser amount of wax which they exude on the under-surface of the leaves ". Before his extension of *M. acuminata* to include seeded forms is justified, there are alternative names to be considered.

M. zebrina Van Houtte ex Planchon in *Flore des Serres* **10** (1854–55), 223, t. 1061–62, was a plant originating from some seeds that germinated spontaneously in the hothouse of M. Van Houtte among orchid material sent from Java. It happened to be one of the extremely pigmented forms of the species under discussion (cf. var. b. *violacea* of Kurz) in which the leaves are purplish beneath and copiously blotched and barred above with purplish brown markings. The floral characters are sufficiently well shown to leave no reasonable doubt about its identity, and the name *M. zebrina* has been adopted by Backer (*Handboek voor de Flora van Java* **3,** 135–36 : 1924) to cover the species as it occurs in Java. Backer says " Very variable plant " and adds : " M. acuminata Auct. fere omn. ; non Coll." from which I can only assume that he could not accept the discrepancy in fertility, as he gives no reason for rejecting *M. acuminata*.

M. malaccensis Ridley in *Trans. Linn. Soc. Ser.* 2. **3,** 385 (1893) is the same species as it occurs in Malaya. Ridley has, following the description : " This is common in the jungles of Malacca, Selangor and Perak, occurring also in Pahang at Tanjong Gajah Mati. It is the ' Pisang karok ' of the Malays. M. zebrina (Flore des Serres t. 1061, 1062) is doubtless a young plant either of this species or of M. sumatrana Becc . . ." Why he should call *M. zebrina* a young plant when citing t. 1062, which includes an inflorescence, is not clear. *M. malaccensis* must be treated (as Backer treats it, *loc. cit. supra*) as a synonym of *M. zebrina*. " Common in the jungles of Malacca " connects it with Kurz's species.

The issue is, then, between *M. acuminata* and *M. zebrina* according to whether we can or cannot follow Kurz in regarding fully fertile plants as conspecific with a seedless and parthenocarpic type. I believe that in this case we not only can but must, because of the existence of a perfect " bridge " between the two. A plant is known which fits in every respect the description of *M. acuminata*, including the possession of a seedless parthenocarpic fruit, but which cannot be taxonomically separated from *M. zebrina* on any character whatever, except its seedlessness. This plant is known in Malaya as *Pisang Lilan*, and it has been in the *Musa* collection of the Imperial College of Tropical Agriculture since 1933. Howes says of it (*Kew Bull.* 1928 : 322) :—" The young bunches of fruit of *M. malaccensis* and of 'Pisang Lilan' are barely distinguishable, and the habit—thin and slender—and general appearance of the two forms is also similar ".

In Trinidad we grow Pisang Lilan alongside fully seeded plants raised from seeds received from Malaya as *M. malaccensis* Ridley, and cannot find a single point of difference except that Pisang Lilan has a slightly larger fruit as well as being parthenocarpic. The occurrence or non-occurrence of parthenocarpy is a more useful character on which to divide " edible " from " seeded " bananas than the actual occurrence or non-occurrence of seeds. Several banana varieties, normally seedless, yield large numbers of seeds on suitable pollination, but they are distinguishable from " seeded " types by the fact that when unpollinated they develop normal fruits. The fruits of truly " fertile " or " seeded " species on the other hand do not develop at all without suitable pollination and consequent fertilization. Investigations of the inheritance of parthenocarpy are in progress, and from hybrids between Pisang Lilan and seeded *M. malaccensis* K. S. Dodds and N. W. Simmonds (paper in the press) have found that it may be ascribed to the action of a single dominant gene, for which Pisang Lilan is heterozygous. Modifiers affect the expression of the gene and influence the amount of parthenocarpic development, so that inheritance is not altogether simple ; but parthenocarpy by itself is obviously not a character on which to separate species.

I do not assume that Pisang Lilan, recorded as a cultivated variety in Malaya, is identical with Rumpf's Pisang Jacki, which he describes as truly wild in Amboina. The significant fact is the existence of seedless and seeded forms within the same species, inseparable on habit or floral characters. In the absence of any alternative identification of *M. acuminata* Colla I take this as sufficient to support the view held by Kurz, and it therefore seems both proper and necessary to apply the older name *M. acuminata* Colla to the fertile *zebrina-malaccensis* assemblage.

An alternative course would be to write off *M. acuminata* Colla as *species ignota*. The common fertile species for which we have to find a name would then be known as *M. zebrina* Van Houtte. This course would not only leave Rumpf's *M. simiarum* unidentified, but would necessitate much more correction of the literature, since others before now have followed Kurz.

J. G. Baker particularly (*Ann. Bot.* 7, 215 : 1893) seems to have been

influenced more by the writings of Kurz than by Colla's original description. He says : " Typical *M. acuminata* is wild and has fruits full of seed. From this several seedless cultivated varieties are immediately derived, differing in the colour of the leaves and fruit." His description is likewise derived mainly from Kurz.

K. Schumann, in his very inaccurate treatment of *Musaceae* in Engler's *Pflanzenreich* (1900), keys off *M. acuminata* under species with glabrous rachis and *M. malaccensis* under species with pubescent rachis, and thus manages to get them far apart, missing out *M. zebrina* as a valid species altogether. I cannot trace where he acquired his information about the rachis : actually it may be either glabrous or pubescent in forms of this affinity.

Until recently *M. acuminata*, whichever name has been used for it, has been regarded as a species of the Malay Peninsula and Archipelago. I now refer to it forms from Burma, Indo-China and Assam, although some of them differ very much in appearance from any of the forms hitherto described, and their inclusion therefore increases the range of variation to be recognized within the species.

The Burmese form is the most distinct, having a fully pendent fruit-bunch instead of the subhorizontal bunch indicated by Colla as *spadix subnutans*, and differing also in other characters which will be described later. None of the differences, however, appears to me to necessitate specific distinction ; and they are all overridden by genetical evidence, since the form has been found to be completely interfertile with authentic *M. malaccensis sensu stricto.*

Once the Burmese form has been admitted, that from Indo-China cannot be excluded, for it is in some characters intermediate between the Burmese and the Malayan. Its existence suggests again that extensive collection would be likely to produce many more intergrades.

The form from Assam that I refer here has not been studied as long as the others and is included with less confidence. On field characters it is much nearer to the Malayan plants than is the Burmese form, and indeed so similar in appearance that in the absence of any genetical evidence its separation would be very difficult to justify. Preliminary observations, however, have suggested that genetically the Assam plants are not as close to the Malayan as they appear to be. Further research is needed to establish, first, whether the genetic differentiation is enough to require specific distinction, and second, whether in this case also intermediate forms will prevent any sharp definition. At present I can only adopt the course that I believe would be followed by most field botanists and include the form in *M. acuminata.*

Several plants described under other names seem to me possibly or probably *M. acuminata.* They include *M. sumatrana* Beccari, *M. microcarpa* Beccari, *M. truncata* Ridley and *M. errans* (Blanco) Teodoro. In the case of *M. truncata* I consider the evidence (given below in the notes on Malayan material in the I.C.T.A. collection) sufficient to justify reduction to synonymy. In the other cases the evidence is scarcely sufficient for a definite reduction, but the plants are discussed among the notes on distribution of *M. acuminata.*

In so variable a species it would be a great convenience if we could define a certain number of varieties and forms to which individual specimens could be referred. But considering how imperfectly the dozen clones in the I.C.T.A. collection can represent the whole population, I believe the time is not yet ripe for any formal subdivision of the species. Ridley (*Journ. Roy. As. Soc. S. Br.* **59** : 205 and *Fl. Malay Penins.* **4** : 295) has described a var. *minor* of his *M. malaccensis* ; but this needs more study and may well prove specifically distinct. Backer (*loc. cit.*) recognizes three forms of *M. zebrina* in Java but emphasizes that they intergrade : they are forma *typica* (regarded as corresponding to *M. malaccensis*), forma *cerifera* with its vegetative parts very waxy and a hairy ovary, and forma *rutilipes* with the petiole and underside of midrib yellow-red. Field studies are desirable before a similar treatment can be extended to mainland forms, and in some cases genetical experiments will be necessary to establish relationships. Meanwhile it seems convenient, and can do no harm, to refer to known entities in the I.C.T.A. collection or elsewhere by their district of origin as local forms (but *forms* in English, not *formae*) ; and that course has been adopted in the notes given below.

I now attempt a general description of the species as we at present recognize it, followed by notes on its distribution and upon the more interesting of the clones established in Trinidad.

Musa acuminata *Colla*, Mem. Gen. Musa 66 (1820).

Musa simiarum Rumph. Herb. Amb. **5,** 125 et t. 61 fig. 1 (1750) ; Miq. Fl. Ind. Bat. **3** : 589 (1855) ; Kurz in Journ. Agric. Hort. Soc. India **14** : 297 (1865–66) *p.p. quoad var. a. sylvestris et var. b. violacea excl. var. c. culta et var. d. corniculata.*

Musa acuminata Colla *loc. cit.* ; Zollinger, Syst. Verz. Ind. Archip. 74 (1854) ; Kurz in Journ. Agric. Hort. Soc. India n.s. **5** : 112–168 (1878) *p.p.* ; Baker in Ann. Bot. **7** : 215 (1893) *excl. var. culta Kurz et syn. Berterii Colla et aphurica Rumph.*

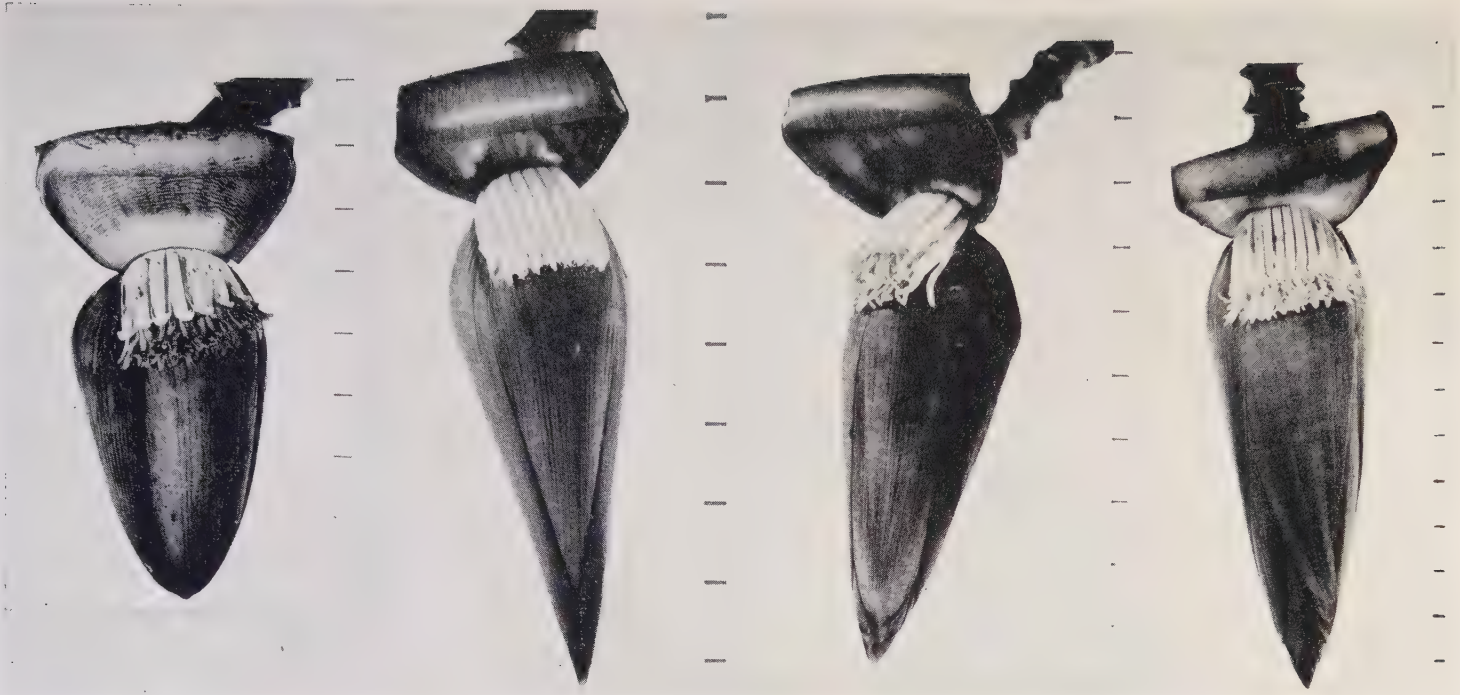
Musa zebrina Van Houtte ex Planch. in Flore des Serres **10** : 223 et t. 1061–62 (1854–55) ; Backer in Flora van Java **3** : 136 (1924).

Musa malaccensis Ridley in Trans. Linn. Soc. Ser. 2, **3** : 385 (1893) et in Fl. Malay Penins. **4** : 293 (1924).

Musa truncata Ridley in Journ. Fed. Malay States Mus. **4** : 80 (1902) et in Fl. Malay Penins. **4** : 294 (1924).

Plant stooling sparsely (1–2 stems, *Ridley*) or freely (4–30 stems, *Backer*) ; pseudostems more slender than those of most cultivated bananas, usually 3–5 metres high (up to 7 m., *Backer*), rarely exceeding 25 cm. in diameter at base, with varying development of brown-black markings from almost green to almost entirely black, or sometimes reddish brown in lower parts ; leaf-sheaths and petioles commonly more or less glaucous or pruinose, but extremely variable in development of wax.

Leaf blades oblong, 2–2·5 m. long, 40–60 cm wide, truncate at apex, usually rounded at base, sometimes rounded on one side and acute on the other, varying from green or green tinged with purple to wholly purple on the lower surface, green above, with or without flecks or bars of purplish brown pigmentation, variable also from not or slightly to



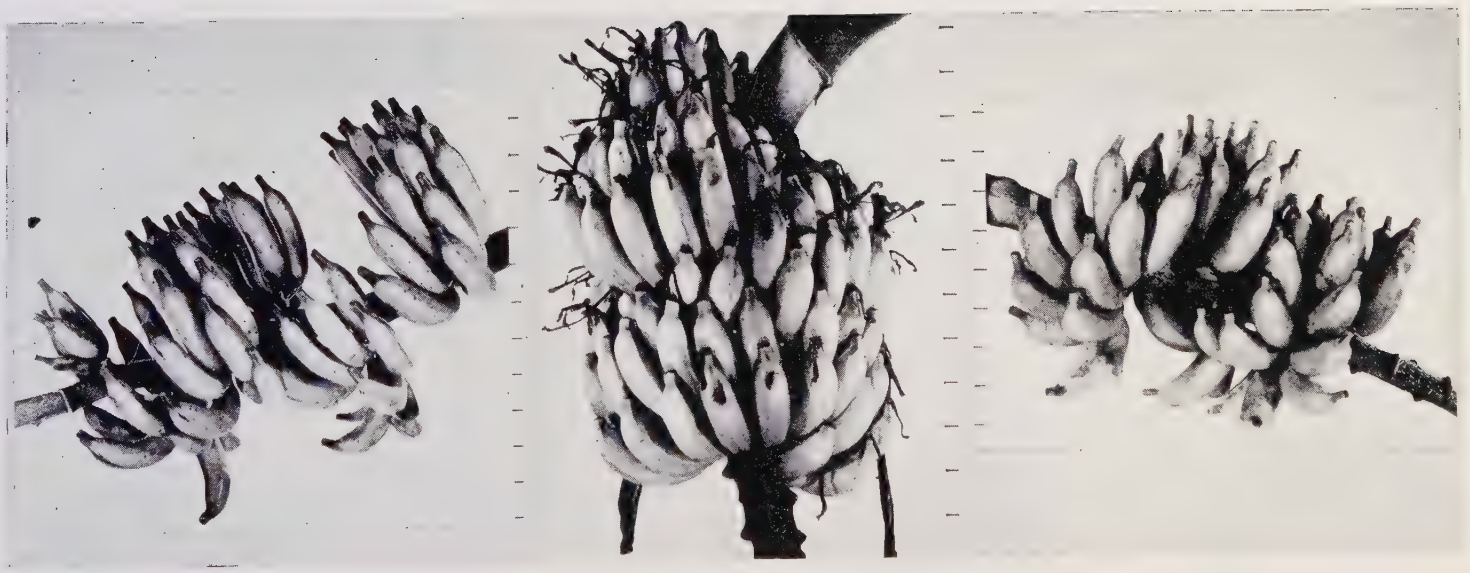
1. The Buitenzorg form. 2. The Selangor form. 3. The Annam form. 4. The Tavoy form.

M. acuminata Colla. Male buds in advanced blooming.

Scale in inches in all figures.

Photographs by K. S. Dodds.

[*To face page 22.*



1 2 3

M. acuminata Colla. Fruit bunches. FIG. 1 the Selangor form; fig. 2 the Tavoy form; fig. 3 the Annam form.

Scales in inches in all figures.

Photographs by K. S. Dodds

To face page 23]

heavily waxy beneath, midribs green, greenish yellow, or more or less strongly tinged with red below; petioles 60–90 cm. long, in some forms very slender, in others stouter, their margins sometimes almost erect, leaving an open adaxial channel, in other forms strongly incurved over the channel and almost covering it, usually definitely developed, especially below, where the petiole passes into the leaf-sheath, here usually closely appressed to the pseudostem, occasionally slightly bent outward away from it, early becoming scarious in this region, when young often bordered with a red line.

Inflorescence subhorizontal or vertically deflexed, its peduncle and rachis usually more or less thickly pubescent with brown hairs, sometimes glabrous; basal flowers female, the number of female "hands" varying up to about 10, commonly fewer, occasionally more, upper hands male.

Female flowers about 16 per bract in two rows; compound tepal about 2·5 cm. long (to 4·2 cm., *Backer*) white, yellowish or slightly purple, with white or yellow tip and lobes; free tepal translucent, about half as long as the compound tepal; ovary pale green, yellowish green, or purplish, glabrous or with a few fine hairs near the base, or (*fide Backer*) more or less thickly covered with soft hairs.

Male bud in advanced blooming ovoid to turbinate, usually acute, the bracts convolute, imbricate at the extreme tip only, or rather strongly imbricate. Bracts various shades of purple or red, from bright red to dark violet, ovate, usually acute at apex, sometimes yellow at the extreme tip; outer surface more or less glaucous, faintly ribbed longitudinally, inner surface paler, light red or yellowish, always paling towards the base. Only one bract lifted at a time, bracts revolute on fading and early deciduous, often a little before the flowers they subtend.

Male flowers about 20 per bract, in two rows; compound tepal 3·5–4·5 cm. long, about 1·2 cm. wide, white, cream, yellowish or pale orange, sometimes purplish, upper part of tepal including the teeth, yellow, varying from pale lemon yellow to bright orange, the 2 outer teeth varying from 2 to 7 mm. long, with a dorsal filiform appendage 1–2 mm. long, the centre lobe usually slightly shorter and broader; free tepal about half as long as the compound tepal, translucent, boat-shaped, variable at apex but usually transversely corrugated just below the apicula; stamens at first as long as the perianth or slightly shorter, later exserted, their anthers usually pink before dehiscence.

Fruit bunch asymmetrical if borne subhorizontally, compact if vertically, the fruits exhibiting marked geotropic curvature in either case. Individual fruit 8–13 cm. long, 1·5–3 cm. in diameter, subcylindrical, the angles of the young fruit almost disappearing at ripeness in most forms, rather abruptly narrowed at base into a pedicel of about 1 cm. (sometimes pubescent), and at apex into a prominent acumen 0·6–1·5 cm. long; pericarp about 2 mm. thick, bright yellow at full ripeness, pulp whitish or cream to yellow.

Seeds (when present) dull black, smooth (ex *Backer*) or more commonly minutely tuberculate, irregularly angulate-depressed, 6–7 mm. across and about 3 mm. high.

Distribution : Assam, Burma, Siam, Annam, Malay Peninsula and Archipelago, Philippine Islands.

Notes on Distribution and Local Forms.

Java. Survey of the distribution may conveniently start with the Malay Archipelago, simply because the species has been longest recognized and best described from that region. We have at present insufficient knowledge for any speculation about whether the centre of origin of *M. acuminata* was in the Archipelago or on the mainland.

Living material in the I.C.T.A. collection from Java comes only from the Botanic Garden at Buitenzorg, but even that shows variation. Two packets of seeds received in 1929 as *Musa zebrina* and *M. zebrina* var. *cerifera* respectively both gave very heterogeneous families of seedlings, including some individuals with the heavy purple pigmentation characteristic of the original *M. zebrina* pictured in *Flore des Serres*, and others showing partial sterility. We retained four clones, distinguished as C, D, E and F. Of these E is particularly interesting, for though phenotypically it shows no evidence of hybridity, nevertheless its chromosomal association is similar to that of a wide hybrid (Dodds, unpub. ; cf. also G. B. Wilson in *Genetics* **31,** 475–482 (1946), who has described chromosomal association in his material of this clone).

A later consignment of seeds received in 1938 gave a more uniform progeny, from which I conclude that the first lot was either collected from a larger number of individuals or was the result of cross-pollination among several forms kept in the Gardens. We retain a clone from the later consignment (I.R. 205) as Clone Buitenzorg, and this, which may be referred to as " the Buitenzorg form " has these characteristics :

Upper parts of leaf-sheaths olive green with moderately heavy black blotching, not waxy ; leaf blades and midribs green, lightly glaucous beneath ; petioles slender, with narrow erect margins. Male bud in advanced blooming blunt, the bracts slightly imbricate at the tip ; bracts dull purple and lightly glaucous outside, light red and shining within. Male flowers whitish, tinged purple at base, the yellow teeth of the compound tepal only about 2 mm. long. Fruit bunch nearly horizontal, its peduncle densely pubescent ; fruit about 8 cm. long, 2 cm. diameter, minutely puberulent towards the base, the pedicel very short and not very distinct, acumen at least 1 cm. long.

Sumatra. We have no living material from any island of the Netherlands East Indies other than Java, and I have not found Sumatra specifically mentioned in the literature of *M. acuminata*, though the species almost certainly must occur there. The identity of *Musa sumatrana* Beccari (in *Illustr. Hortic*, **27,** 37. t. 375 : 1880) needs further investigation. The figure cited is of a young plant with the purple-barred leaves of the extremely pigmented form of *M. zebrina*. I have seen no description by Beccari. J. G. Baker (*loc. cit.* p. 219) puts the species into his section *Rhodochlamys* and gives a description, but how he compiled it is not stated. He did not know the colour of the bracts, yet refers to " our specimen in flower . . . . from the Poona Botanic Garden ", and describes the flower as having a free tepal nearly as long as the compound tepal. He

also gives the dimensions of dried fruits and cites a specimen, *Beccari* 489. This reads like a composite description, and if Baker took the tepal character from the plant from Poona, which may have been wrongly named, confusion might easily have occurred. Beccari in describing his *M. microcarpa* in 1902 remarked that it seems much like *M. sumatrana* but has a smaller fruit ; *M. sumatrana* has also lenticular seeds, but more irregular and larger (6–7·5 mm. in diameter).

H. N. Ridley (in *Kew Bull.* 1926, p. 90) says : " This species has never been fully described, Beccari's description being only that of the foliage of a young plant, so I here give a description of it." Which he proceeds to do : but as he describes the *calyx* as 2 cm. long and the *corolla* 4 cm., the floral characters are rather confusing. Ridley also has " baccis 6 in uno serie " : but on reference to *Beccari* 489 in Kew Herbarium I find it has *biseriate* fruits, which would pass for those of *M. acuminata.*

From all this I wonder whether " *M. sumatrana* " in the literature covers one, two or three plants ; and should not be surprised to find *M. acuminata* mixed up somewhere in the complex. *H. S. Yates* 1900 in Leiden Herbarium from Sumatra det. *M. sumatrana* ? is another plant again, having a cylindrical seed which puts it into a section of *Musa* quite removed from Beccari's plant with lenticular seeds.

Borneo. In Borneo there is *Musa microcarpa* Beccari, described and figured in *Nelle Foreste di Borneo* (1902) p. 623. I have checked Beccari's description, his photograph of the fruit and his line drawing of the male flower, and cannot find a character to separate *M. microcarpa* from *M. acuminata,* and although I hesitate to place it definitely in synonymy without seeing living material I have very little doubt that *M. microcarpa* represents our polymorphic species in Borneo.*

New Guinea. J. G. Baker (*loc. cit.*) gives the distribution of *M. acuminata* as " extending eastward to New Guinea " but I cannot trace the basis of his assertion. The species well may extend to New Guinea ; in any case there is in that island *M. banksii* F. v. Muell. which is very closely allied, though I keep it separate at present on account of its hermaphrodite basal flowers.

Philippine Islands. In the Philippines there is the wild banana called *Musa troglodytarum errans* by Blanco in *Flora de Filipinas* and raised to specific rank by Teodoro (*Philipp. Journ. Sc. C.* 10 : 390 : 1916) as *M. errans.* This needs further study before it can be positively identified with *M. acuminata,* but I have very little doubt that it represents a Philippine form of that species. Introduction no. 181 in the I.C.T.A. collection was of seeds sent to us as *M. errans* by the Bureau of Plant Industry, Manila, in 1938. Unfortunately we failed to establish plants : but a photograph that accompanied the seeds shows a fruit bunch, borne subhorizontally, that is very like a bunch of Malayan *M. acuminata* in all but the number of " hands ". Apparently *M. errans* in the Philippines can produce up to 18 " hands " in a bunch, but this character

*While these notes were in the press, I had an opportunity to visit Sarawak and observed there what seemed to me certainly a form of *M. acuminata* with smaller fruits than any clone studied in Trinidad. I think this is most probably Beccari's *M. microcarpa.* Material has been sent to I.C.T.A. for futther study.

and green bracts seem to be the only conspicuous differences between it and *M. acuminata*.

Malaya.* From Malaya we have I.R. 53 from Kajang, Selangor, F.M.S., collected in 1928 by F. N. Howes and authentically representing *Musa malaccensis* Ridley ; I.R. 109 sent with a provisional identification as *M. flava* Ridl. but certainly not that species ; and I.R. 180 collected in Kedah in 1938. There is no striking difference between these three collections, which perhaps represent fairly the species as it occurs in the lowlands of Malaya.

We have used Introduction no. 53 extensively in our banana-breeding programme under the label *M. acuminata* Clone A (earlier as *M. zebrina* A). It may also be referred to as " the Selangor form " of the species, and has the following characters :

Upper parts of leaf-sheaths olive green with a purplish tinge, with moderately heavy black blotching, rather heavily waxy ; leaf-blades rather heavily waxy beneath, midribs red beneath and often purplish above also ; young leaves on suckers often with blotches or bars of purplish brown ; petioles very slender, with narrow incurved margins. Male bud in advanced blooming acute, the bracts convolute at the tip ; bracts reddish purple and lightly glaucous outside, light red and shining within. Male flowers cream, with no purple tinge, the bright yellow teeth of the compound tepal nearly 5 mm. long. Fruit bunch nearly horizontal, its peduncle densely pubescent ; fruit about 12 cm. long, including a very distinct pedicel (1·5 cm.) and acumen (at least 1 cm.), greatest diameter about 2·5 cm.

Pisang Lilan (I.R. 143), which has been discussed above, conforms to the same description except in fruit—up to 15 cm. long, 3 cm. in diameter, parthenocarpic and seedless.

We also had in 1930, but unfortunately lost after fruiting, I.R. 104 sent as *Musa truncata* Ridl. which was of great interest. *M. truncata* was described by Ridley as a big banana, 20 ft. tall, with fruit 5 inches long. Other characters were a purple-brown pseudostem and deep violet bracts ; the habitat, in dense forests, at about 2,000 ft. altitude, above the zone of *M. malaccensis*. The size of plant and fruit suggests a genotype likely to be useful in banana breeding, and for this reason the introduction was specially welcome. The plants raised, however, though they had very copiously pigmented pseudostems, almost black, and the deep violet acute bud described for *M. truncata*, did not live up to the plant and fruit dimensions, and I could see no good reason to regard them as specifically distinct from the other Malayan material of *M. acuminata* in the collection. The plants were not vigorous under our lowland conditions, and all ultimately died.

Subsequently I was able to examine in the Kew Herbarium several

*Recent observations in the field in Malaya have strengthened the opinions here expressed. There are certain differences in habit permitting a general distinction between lowland forms referred to *M. malaccensis* and upland forms referred to *M. truncata*, but I observed none of a kind warranting specific separation. Both are highly variable, and intensive study would probably show that they intergrade.

specimens determined as *M. truncata*, including *Ridley* 13694 and *Ridley, Robinson and Kloss* March 1917, both of which have fruit, and found the fruit to be only 9 cm. long, plus a 2·5 cm. pedicel. From them I conclude that our introduction 104 was correctly named, and that *M. truncata* Ridley is only a form, perhaps characteristic of the higher lands in Malaya, of *M. acuminata*. Ridley probably found originally a particularly well-grown specimen.

Burma. Our material from Burma comprises two collections, I.R. 124 (Clone Calcutta 4) received from the Royal Botanic Garden, Calcutta, in 1931, and I.R. 187 (Clones Tavoy and Long Tavoy) received in 1938 from C. W. D. Kermode, Esq., Silviculturist, Maymyo, Burma. The Burmese name was given in both cases as Taw-byaw, and the two collections differ only slightly in quantitative characters such as size of bunch and length of fruit, important to the banana breeder but not to the systematist. Our three clones may therefore be referred to collectively as " the Tavoy form " with these characters :

Upper parts of leaf-sheaths bright green, with heavy reddish brown blotching, not at all waxy ; leaf blades not glaucous beneath, midribs pale green or yellowish ; petioles relatively stout, with well developed erect margins, very early becoming scarious where appressed to pseudostem. Male bud in advanced blooming acute, the bracts usually distinctly imbricate at the tip ; bracts dark violet-purple and glaucous outside, light red and shining within. Male flowers whitish, the bright yellow teeth of the compound tepal up to 7 mm. long. Fruit bunch pendent and compact, its peduncle densely pubescent ; fruit 8–12 cm. long, pedicel very short and not very distinct, acumen about 0·5 cm. long, withered style tending to persist.

Indo-China. Introduction no. 144 (Clone Annam) was sent from Kew as plants, raised from seed collected in Annam, locality unspecified. This, " the Annam form ", has these characters :

Upper parts of leaf-sheaths dull yellowish green, with moderately heavy brown blotching, slightly waxy ; leaf blades not glaucous beneath, midribs yellowish-green, moderately waxy on the lower side ; petioles rather slender, with well developed erect margins, early becoming scarious where appressed to pseudostem. Male bud in advanced blooming acute, the bracts distinctly imbricate at the tip, indistinguishable in all respects from the bud of the Tavoy form. Male flowers whitish, the bright yellow teeth of the compound tepal about 5 mm. long. Fruit bunch nearly horizontal, its peduncle and rachis glabrous ; fruit about 10 cm. long, 3 cm. diameter, with a short (0·5 cm.) but quite distinct pedicel and well-marked acumen 0·5 cm. long.

Siam. We have no living material from Siam, but the species could hardly be absent from that country, and I refer to it *Kerr* 6183, Doi Pêpô, c. 800 m., 29 June 1922, " Klue Mon." Possibly *Kerr* 14821, Ban Pieni Sangtata, c. 50 m., 27 March 1918, " Klui tuan ", and other specimens in Dr. A. F. G. Kerr's collection of Siamese *Musa* spp. are also *M. acuminata*. The range of variation of the species in Siam is of great importance and much needs further study.

Assam. In Assam there is a plant represented at I.C.T.A. by I.R. 209 (Mariani), I.R. 211 and I.R. 241, all sent to us by P. H. Carpenter Esq., of the Indian Tea Association at Tocklai Experimental Station. I.R. 209 was collected in the Mariani Range, and is a rather larger plant with larger fruits than the other collections, but all agree in qualitative characters. The characters of " the Mariani form " are :

Upper parts of leaf-sheaths dull pale green, with light to moderate black blotching, rather heavily waxy ; leaf blades not glaucous beneath, midribs green like the lamina, only waxy near the base beneath ; petioles relatively stout, with well developed erect margins, not as closely appressed to the pseudostem at base as in most forms and not soon becoming scarious. Male bud in advanced blooming acute, the bracts convolute at the tip, the whole bud usually aborting before the fruits are mature and falling off ; bracts rather bright red, moderately glaucous outside, yellow and shining within. Male flowers pale orange-yellow, the teeth of the compound tepal deep orange and about 5 mm. long. Fruit bunch carried slightly below the horizontal, its peduncle glabrous ; fruit on some individuals 10 cm. long, 2·5 cm. diameter, on others up to 12 cm. long, 3 cm. diameter, pedicel about 1 cm., acumen 0·5 cm. and less pronounced than in other forms.

If this form has to be separated from *M. acuminata* it will probably prove conspecific with a plant from Tagwin, Myitkyina, Upper Burma (I.R. 183), which at present, pending cytogenetical studies, we cannot place. The Tagwin plant closely resembles the Mariani form in bract and flower colour, and in the early abortion of the male bud—only in this case the bud aborts earlier, usually after producing only a dozen male " hands." It differs in having hermaphrodite flowers in the basal bracts, and if this character has to be admitted among those of *M. acuminata* the species will become bigger and more complex than ever. The problem is interesting for more than one reason, for at the other end of the range of *M. acuminata* we have *M. banksii* F. v. Muell. in New Guinea and Queensland which also has hermaphrodite basal flowers. I at present keep it distinct on that character, but more for convenience than from conviction, as it behaves genetically like *M. acuminata*. If the Tagwin plant has to be admitted, linked to the species through the Mariani form, exclusion of *M. banksii* will become indefensible.

It is scarcely going too far to state that the problems of banana breeding are nearly all comprehended within the genetics of *M. acuminata sensu lato*. This interbreeding population has a range of variation in qualitative characters fully as wide as the range shown by the cultivated varieties closely related to it, which include most of the really important varieties both of dessert bananas and of plantains. Further knowledge of its protean forms is therefore a major desideratum.

RESEARCHES ON SILENE MARITIMA AND S. VULGARIS : XXVII*.

E. M. Marsden-Jones and W. B. Turrill.

Swedish material of S. maritima.

Introduction.

The families dealt with in this paper were all derived from seed collected in Sweden : Torekow, Skåne, 1 October, 1930, by Dr. B. Lindquist. 429 plants were grown and scored. All of these were uniform or not classifiable into distinguishable groups for the following characters. *Habit* : compact, subprostrate, with ascending branch ends ; stems from 1·5 to 3·8 dm. long ; overwintering barren shoots always present (chamaephytic). Little or no damage was done to any of the plants by *Marssonina*. *Indumentum* : all plants glabrous. *General leaf shape* : narrowly linear oblanceolate, acute, from 2·0 cm. long and 3·0 mm. broad to 3·7 cm. long and 5·0 mm. broad for well-developed leaves. *Inflorescence* : 1 to 7 flowers, all slightly zygomorphic. *Corolla* : all petals white. *Anthers* : all purple (when present). *Capsules* : all with reflexing teeth and all obloid. *Immature seeds* : all purple. *Mature seeds* : all modified armadillo, some almost indistinguishable from typical armadillo. There was segregation for all the other characters investigated.

The following sample and families were raised :

P. 4. Sweden : Topekow, seed of wild origin. 28 plants.
N. 137 = P. 4 plant 17 selfed. 36 plants.
N. 138 = P. 4 plant 6 × P. 4 plant 17. 56 plants.
N. 143 = P. 4 plant 9 selfed. 62 plants.
N. 150 = P. 4 plant 27 × P. 4 plant 9. 57 plants.
N. 152 = P. 4 plant 27 selfed. 17 plants.
N. 153 = P. 4 plant 6 selfed. 15 plants.
N. 287 = N. 150 plant 8 selfed. 53 plants.
N. 288 = N. 138 plant 2 selfed. 53 plants.
N. 289 = N. 137 plant 1 selfed. 52 plants.

Selected specimens and details of scorings of the above are filed in the Herbarium at Kew. Here only such details are given as justify the conclusions reached and allow adequate comparision with previously published work.

No plants were totally devoid of anthocyanin in both vegetative and floral parts. For example, all plants had purple anthers (in so far as anthers were present) and purple immature seeds. All the thirty plants without anthocyanin in the vegetative parts, however, lacked anthocyanin also in the calyx. The converse is also true : all plants without anthocyanin in the calyx had none in the vegetative parts (see K.B. 1935, 212, for comparable results with British material of *S. maritima*). The actual figures for all 429 plants were :

Anthocyanin in vegetative parts present 401 : absent 30
„ „ calyx present 377 : absent 25

*Continued from K.B. 1946, 107 (1947).

ANTHOCYANIN DEVELOPMENT.

	In vegetative parts				In calyx			In filaments		In stigmata	
	Much	Medium	Little	None	Much	Medium	None	Purple	White	Purple	White
P. 4 ...	28				28			19		28	
N. 137 ...	34	2			36			15	4	28	7
N. 138 ...	55	1			56			51		56	
N. 143 ...	3	40	12	10	39	6	8	18		51	
N. 150 ...	49			7	43		5	27		38	1
N. 152 ...	13			4	13		4	1		12	1
N. 153 ...	15				14			4		12	
N. 287 ...		44		9	1	42	8	9	3	47	2
N. 288 ...	6	47			30	22		20	8	51	1
N. 289 ...	4	48			2	45		6	3	47	
Totals ...	207	182	12	30	262	115	25	170	18	370	12

We know from previous researches (K.B. 1932, 229, and K.B. 1938, 248) that both complementary and inhibiting genes are involved, in various stocks, in producing or preventing the appearance of anthocyanin. In the plants dealt with in this paper those without anthocyanin in vegetative parts and calyces must have had inhibitors for anthocyanin development acting in the earlier states of seasonal growth (up to the formation of calyces) or complementary genes whose interaction was delayed to the stage of stamen (very rarely petal) formation.

	Calyx shape.					Sex.		
	Broadly ellipsoid	Ellipsoid	Narrowly ellipsoid	Inflated	Cylindric	Hermaphrodite	Hermaphrodite and female	Female
P. 4 ...	6	11	2	5	4	12	7	9
N. 137 ...	5	24			7	8	11	16
N. 138 ...	5	50			1	32	19	5
N. 143 ...		2		52		5	15	30
N. 150 ...	8	24		2	7	27	1	12
N. 152 ...		4			10	1		12
N. 153 ...		7			5	3	1	8
N. 287 ...	13	30	1		5	1	11	37
N. 288 ...	9	36			7	6	26	20
N. 298 ...	17	28			2	2	8	37
Totals ...	63	216	3	59	48	97	99	186

Anthocyanin blotch appeared in only two plants (in N. 287), possibly as the result of mutations.

The general occurrence of anthocyanin in the plants of P.4 and their offspring is shown in other floral parts besides anthers and immature seeds. Thus :

Filaments : purple 170 : white 18.
Stigmata : purple 370 : white 12.

Calyx shape. The occurrence of inflated calyces in 5 plants from the wild and in plants bred from one of these (N. 143 and N. 150) suggests infiltration of *S. vulgaris* genes. Apart from the inflated type, ellipsoid, with its modifications broadly and narrowly ellipsoid, and cylindric are the types represented. All recorded types appeared amongst the 28 plants of the wild sample. Selfing reduced the amount of variation in offspring families.

Sex. Female plants were rather numerous in the wild sample. In all bred families hermaphrodite, female, and hermaphrodite and female appeared except in N. 152 which had no plants of the last class. We also recorded changes from hermaphrodite to female or to mixed flowers from 1932 to 1934 in 2 of the plants of the original sample.

There was more overlapping than not overlapping for petals but less overlapping than not overlapping for segments. All four possible combinations occurred. Most plants had strictly bilobed petals a very small minority in 7 families had some multilobed petals. The depth of petal lobing and degree of development of corona showed a considerable range. In the F_2 families N. 287, N. 288, N. 289, 44 plants showed fluctuation in depth of petal lobing on the same individual, while in these families coronal development similarly fluctuated in 44 plants (not always the same as the former 44 plants).

Conclusions.

There is no doubt that the 429 plants are to be classified into *S. maritima.* The following characters favour this determination : compact, subprostrate habit and overwintering barren shoots, absence of pubescence, shape of leaves, flowers 1 to 7, immature seeds purple, capsules obloid with reflexing teeth, and modified armadillo seeds. On the other hand, there is evidence of infiltration of genes from *S. vulgaris* presumably through hybridization in the past. The slightly zygomorphic flowers in all plants, inflated calyx in 5 plants of the wild sample and in some plants in which P. 4 plant 9 entered, and the frequent occurrence of small scales or bosses all indicate the influence of *S. vulgaris.* It is of interest to recall the analysis of the offspring of a wild hybrid (K.B. 1931, 391) between English material of *S. maritima* and *S. vulgaris.* The hybrid was found at the Abbotsbury end of the Chesil Beach, Dorset. *S. maritima* was by far the commoner of the two species in the immediate neighbourhood and the natural offspring of the hybrid showed a general predominance of *S. maritima* characters, with, however, in most plants clear indications of *S. vulgaris* genes. The plants of Swedish origin dealt with in this paper must be considered as resulting from the continued back-

Corolla.

	Petals		Segments		Lobing		Depth of lobing					Corona					
	Over-lapping	Not over-lapping	Over-lapping	Not over-lapping	Bi-lobed	Multi-lobed	¾	⅔	⅔ - ¾	½ - ¾	½ - ⅔	Scale	Small scale	Boss	Boss to small scale	Small scale to scale	Boss to scale
P. 4 ...	13	15	23	5	28		19	9				10	17	1			
N. 137 ...	21	14	13	22	30	5	36						29	6			
N. 138 ...	50	8	37	19	52	4	53	3				3	52	1			
N. 143 ...	45	5	33	17	48	2	36	14				3	45	2			
N. 150 ...	25		19	14	39		19	20				14	21	4			
N. 152 ...	3	10		13	13		10	3					4	9			
N. 153 ...	9	3	6	6	12		5	7				2	9	1			
N. 287 ...	10	39	3	46	47	2	23	3	22	1		7	9	9	15	6	
N. 288 ...	27	25	1	51	48	4	25	8	19			8	29	2	7	4	1
N. 289 ...	31	13	20	24	42	2	42		1		1		19	13	10	1	
Totals ...	234	132	155	217	359	19	268	67	42	1	1	47	234	48	32	11	1

Plate 5

Silene maritima, N 150 plant 8.

[*To face page* 32.

PLATE 6

Silene maritima, N 150 plant 33.

To face page 33]

crossing of a *S. maritima* × *S. vulgaris* F_1 with *S. maritima*. This would result in so-called infiltration of *S. vulgaris* genes into a *S. maritima* population.

Sex, degree of development of corona, and depth of petal lobing in some individual plants varied from flower to flower or petal to petal. These fluctuations are probably due, at least in part, to factors outside the control of chromosomal genes.

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RESEARCHES ON SILENE MARITIMA AND S. VULGARIS : XXVIII.*

E. M. Marsden-Jones and W. B. Turrill.

Studies on material of s. vulgaris from the pyrenees.

Introduction

In 1929 we received four packets of wild seed of *Silene* collected in the Pyrenees by H. Montford, B.Sc. These were sown at Potterne, and the plants raised were scored on 21.6.1931 as P.5, P.6, P.7, P.8. The plants are to be classified as *S. vulgaris*, but showed a number of unusually interesting characters including those of the inflorescence, calyx, capsules, and seeds. All the plants, and all the families dealt with in this paper had no over-wintering barren shoots but behaved as winter hemicryptophytes. Many of the plants, particularly in P.7, were attacked by *Marssonina*, an *S. vulgaris* characteristic. The inflorescences were often very large and floriferous with up to 68 flowers in one inflorescence, and in an F_1 plant from a cross with British *S. vulgaris*. there were 85 flowers in one inflorescence. This many-flowered character contrasts markedly with the one to few-flowered inflorescences occurring in various high mountain plants growing in the Central European Alps. The flowers in all the families dealt with in this paper were zygomorphic.

The following are the samples and families analysed here :

P.5, P.6, P.7, and **P.8** : samples from wild seed.

N.157 = P.6 plant 2 selfed.

N.204 = P.7 plant 1 selfed.
N.339 = N.204 plant 1 selfed.
N.342 = N.204 plant 17 selfed.
N.343 = N.204 plant 29 selfed.

N.151 = P.8 plant 5 selfed.
N.297 = N.151 plant 5 selfed.

N.186 = N.12 plant 219 × P.7 plant 1.
N.346 = N.186 plant 15 selfed.
N.351 = N.186 plant 9 selfed.

SAMPLES GROWN FROM WILD SEED.

P.5. Seed collected near Gistain, Huesca, Spain, 1200–1400 m. 14 plants in the sample.

Habit : stems up to 4·8 dm. tall, erect ; strict 4 : non-strict 10 ; anthocyanin in vegetative parts medium 2 : little 12 ; all plants glabrous.

Leaves : narrowly elliptic to elliptic-lanceolate, shortly acuminate, averaging 5·2 cm. long and 1·5 cm. broad, margins eciliate.

Calyx : inflated 7 : subinflated 7 ; anthocyanin medium 4 : little 10.

Corolla : all white ; all petals bilobed, with 3/4 lobing, small scale 2 : boss 12, no blotch, all petals and segments not overlapping.

Sex : hermaphrodite 11 : female 3.

Filaments : purple 11 ; anthers purple 11.

Stigmata : purple 13 : white 1 ; immature seeds purple 3 : white 8.

Mature capsules : all ovoid, spreading teeth, rather wide mouth.

Mature seeds : tubercled 4 : armadillo 10.

P.6. Seed collected near Gistain, Huesca, Spain, 1200–1400 m. 3 plants in the sample.

Habit : stems up to 4·9 dm. tall, erect ; not strict ; anthocyanin in vegetative parts little ; few hairs on stems medium on leaves 1 : glabrous 2.

Leaves : narrowly elliptic-lanceolate, shortly acuminate, averaging 7·5 cm. long, 1·5 cm. broad, margins ciliate.

Calyx : inflated ; anthocyanin medium.

Corolla: white; petals bilobed, with 3/4 lobing, small scale 1: boss 2, no blotch, petals and segments not overlapping.

Sex : hermaphrodite.

Filaments and anthers : purple.

Stigmata : purple ; immature seeds white 2.

Mature capsules : obloid, with reflexing teeth and rather wide mouth.

Mature seeds : tubercled (but weakly).

P.7. Seed collected at Azet, near St. Lary, Haute Pyrenées, France, 1100 m. 11 plants in the sample.

Habit : stems up to 6·4 dm. tall, erect ; not strict ; anthocyanin in vegetative parts much 2 : medium 8 : little 1 ; glabrous.

Leaves : not uniform, elliptic, narrowly elliptic-lanceolate, to linear-elliptic, ranging from 8·8 cm. long and 3·3 cm. broad to 6·1 cm. long and 1·3 cm. broad, margins 4 ciliate : 7 eciliate.

Calyx : inflated and very inflated 6 : subinflated 5 ; anthocyanin much 2 : medium 9.

Corolla : deepest colour 2 : medium 4 : pale 1 : white 4 ; petals bilobed with 3/4 lobing, small scale 5: boss 6, blotch present 1: absent 10, petals and segments not overlapping.

Plate 7

Silene vulgaris, P.8, plant 5, grown from seed collected at Azet, near St. Lary, Hautes Pyrenées, France. $\times 4/5$.

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PLATE 8

Silene vulgaris, P.6, plant 2, grown from seed collected near Gistain, Huesca, Spain. $\times {}^{4}/_{5}$.

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Sex : hermaphrodite 10 : female 1.

Filaments and anthers purple 10.

Stigmata : purple ; immature seeds purple.

Mature capsules : ovoid, teeth spreading, rather wide mouth (8 scorable).

Mature seeds : armadillo 8.

P.8. Seed collected at Azet, near St. Laury, Haute Pyrenées, France, 1100 m. 5 plants in the sample.

Habit : stems up to 7·0 dm. tall, erect ; not strict ; anthocyanin in vegetative parts much 1 : medium 3 : little 1 ; few hairs on stems and medium on leaves 3 : stem and leaves glabrous 1 : stem glabrous and few hairs on leaves 1.

Leaves : elliptic-lanceolate to linear-elliptic, ranging from 7·4 cm. long and 2·5 cm. broad to 5·5 cm. long and 1·7 cm. broad, margins ciliate 4 : eciliate 1.

Calyx : inflated 4 : subinflated 1 ; anthocyanin medium 4 : little 1.

Corolla : medium colour 1 : white 4 ; petals all bilobed, with 3/4 lobing, small scale 1 : boss 4, no blotch, petals and segments not overlapping.

Sex : hermaphrodite 1 : hermaphrodite and female 2 : female 2.

Filaments and anthers purple 3.

Stigmata : purple 4 : white 1 ; immature seeds purple.

Mature capsules : ovoid 2 : obloid 3 ; teeth spreading 3 : reflexed 2 ; all rather wide mouth.

Mature seeds : tubercled (weakly) 3 : armadillo 2.

FAMILIES FROM SELFINGS.

N.157 = P.6 plant 2 selfed. 15 plants in the family.

Vegetative parts : uniform and as parent ; stems up to 4·0 dm. tall.

Indumentum : dense 3 : medium 5 : few 1 : glabrous 6.

Calyx : inflated 13 : subinflated 2 ; anthocyanin much 3 : medium 10 : little 2.

Corolla : petals all white, all bilobed, all 3/4 lobing, three plants had very narrow segments (a new type in our collections), all boss, blotch present 6 : absent 9, all petals and segments not overlapping.

Sex : hermaphrodite 13 : hermaphrodite and female 2.

Filaments and anthers : all purple.

Stigmata : all purple ; immature seeds all white.

Mature capsules : all obloid with reflexed teeth and rather wide mouths.

Matured seeds : tubercled (weakly) 11 : weak armadillo 2.

Plants 1, 2, and 5 of N.157 were selfed, from the first and second selfings no viable seeds were produced and from the last only one seedling was raised.

N.204 = P.7 plant 1 selfed. 37 plants in the family.

Vegetative parts : unifrom and as parent ; stems up to 6·9 dm. tall.

Indumentum : all glabrous.

Calyx : all very inflated (as parent) ; anthocyanin much 6 : medium 31.

Corolla : petals all white, bilobed 36 : multilobed 1, all 3/4 lobing, small scale 31 : boss 6, blotch present 1 : absent 36, petals all not overlapping, segments overlapping 7 : not overlapping 30.

Sex : hermaphrodite 25 : female 12.

Filaments and anthers purple 25.

Stigmata : all purple ; immature seeds all purple.

Mature capsules : ovoid 25 : obloid 10 : obloid-ovoid 2 ; teeth spreading 36 : reflexed 1 ; all with rather wide mouth.

Mature seeds : all armadillo.

N.339 = N.204 plant 1 selfed. 10 plants in the family (only 8 flowered)

Vegetative parts : habit characters uniform and as parent but growth poor ; stems up to 4·8 dm. tall.

Indumentum : all glabrous.

Calyx : inflated 8 ; anthocyanin much 2 : medium 6.

Corolla : petals all white, all bilobed, all 3/4 lobing, small scale 7 : boss 1, blotch present 1 : absent 7, petals all not overlapping, segments overlapping 1 : not overlapping 7.

Sex : hermaphrodite 2 : hermaphrodite and female 1 : female 5.

Filaments and anthers : purple 3.

Stigmata : all purple ; immature seeds purple 6.

Mature capsules : ovoid.

Mature seeds : armadillo 1.

This family showed a very high degree of sterility with full open pollination. The parent (N.204 plant 1) on selfing under control produced 46 seeds apparently good from 12 flowers. Of these 16 germinated, but 4 of the seedlings died in early stages of growth.

N.342 = N.204 plant 17 selfed. 4 plants in the family.

Vegetative parts : habit characters uniform and as parent but growth poor ; stems up to 2·7 dm. tall.

Indumentum : all glabrous.

Calyx : inflated 2 ; anthocyanin much 2 : medium 1.

Corolla : petals white 3, bilobed 3, 3/4 lobing 3, boss 3, blotch absent 3, petals and segments not overlapping 3.

Sex : hermaphrodite 2 : female 1.

Filaments and anthers : purple 2.

Stigmata : purple 3 ; immature seeds : purple 2.

The four plants of poor growth, badly attacked by *Marssonina*, produced no mature capsules or mature seeds in open pollination. 11 flowers of N.204 plant 17 on being selfed under control produced 310 seeds but only 3 plants were raised from these to the flowering stage.

N.343 = N.204 plant 29 selfed. 60 plants in the family.

Vegetative parts : fairly uniform and as parent ; stems up to 5·3 dm. tall.

Indumentum : all glabrous.

Calyx : inflated 46 ; anthocyanin much 26 : medium 20.

Corolla : petals white 46, bilobed 41 : multilobed 5, 3/4 lobing 38 : 2/3 lobing 1 : 2/3 to 3/4 lobing 7, boss 46, blotch present 4 : absent 41, petals not overlapping 46, segments overlapping 17 : not overlapping 29.

Sex : hermaphrodite 3 : hermaphrodite and female 10 : female 33.

Filaments and anthers : purple 13.

Stigmata : purple 46 ; immature seeds : purple 43.

Mature capsules : ovoid 23, teeth spreading.

Mature seeds : armadillo 16.

This family showed a high degree of sterility with open pollination. Usually no good capsules and no good seeds were formed. In only two or three plants were more than 10 seeds produced from the total of capsules per plant.

N.151 = P.8 plant 5 selfed. 5 plants in the family.

Vegetative parts : uniform as parent ; stems up to 4·5 dm. tall.

Indumentum : stems all glabrous, leaves glabrous 4 : dense (short) 1.

Calyx : very inflated 5 ; anthocyanin medium 3 : little 2.

Corolla : petals all white, all bilobed, 3/4 lobing, 4 : 2/3 lobing 1, small scale 1 : boss 4, blotch present 3 : absent 2, petals and segments all not overlapping.

Sex : hermaphrodite 3 : female 2.

Filaments and anthers : purple 3.

Stigmata : purple 5 ; immature seeds purple 5.

Mature capsules : ovoid, teeth spreading, rather wide mouth 2.

Mature seeds : tubercled (weakly) 2.

This family also showed considerable sterility with open pollination and selfing under control.

N.297 = N.151 plant 5 selfed. 5 plants in the family.

Vegetative parts : uniform as parent ; stems up to 5·6 dm. tall.

Indumentum : in stems few hairs 5 ; in leaves dense 3 ; medium (hairs of bristly type) 2.

Calyx : inflated 5 ; anthocyanin medium.

Corolla : petals all white, all bilobed, 2/3 lobing 4 : 1/2–2/3 lobing 1, boss 5, blotch absent 5, petals and segments not overlapping 5.

Sex : hermaphrodite 2 : female 3.

Filaments and anthers : purple 2.

Stigmata : purple 5 ; immature seeds : purple 3.

No capsules and no mature seeds were set.

FAMILIES FROM CROSS.

N.186 = N.12 plant 219 × P.7 plant 1. 50 plants in the family.

Vegetative parts : uniform and intermediate between the parents ; stems up to 7·4 dm. tall ; anthocyanin medium.

Indumentum : (stem and leaves) medium 1 : few 11 : glabrous 38.

Calyx : all inflated ; all medium anthocyanin.

Corolla : petals all white, all bilobed, all 3/4 lobing, all boss, blotch absent, petals and segments all not overlapping.

Sex : hermaphrodite 30 : female 20.

Filaments and anthers : purple 30.

Stigmata : purple 46 : white 4 ; immature seeds purple 50.

Mature capsules : ovoid 20 : obloid 3 : ovoid-obloid 27, teeth subspreading, except in plant 30 which had reflexed teeth and wide mouth.

Mature seeds : weak armadillo 20 : armadillo 30.

N.346 = N.186 plant 15 selfed. 53 plants in the family.

Vegetative parts : stems suberect, up to 8 dm. tall, leaves range from lanceolate to narrowly elliptic-lanceolate, acute to slightly acuminate, 6·4 cm. long and 2·1 cm. broad to 3·0 cm. long and 0·9 cm. broad ; anthocyanin much 2 : medium 38 : little 13.

Indumentum : (stem and leaves) dense 1 : medium 4 : few 13 : glabrous 35.

Calyx : all subinflated ; anthocyanin medium 5 : little 48.

Corolla : petals white 51, bilobed 51, 3/4 lobing 51, small scale 2 : boss 49, blotch present 1 : absent 50, petals and segments not overlapping 51.

Sex : hermaphrodite 15 : hermaphrodite and female 4 : female 32.

Filaments purple 12 : white 5 ; anthers : purple 16.

Stigmata : purple 36 : white 13 ; immature seeds : purple 29 : white 20.

Mature capsules : ovoid 3 : obloid 13 : ovoid-obloid 28 ; teeth spreading 19 : erect 20.

Mature seeds : armadillo 46.

N.351 = N.186 plant 9. 26 plants in the family.

Vegetative parts : stems erect 1 : subprostrate and spreading 25, up to 8 dm. tall, leaves elliptic to lanceolate-linear, acute to acuminate from 6·9 cm. long and 3·6 cm. broad to 4·1 cm. long and 0·8 cm. broad, the leaf shape range being greater than in the grandparents or F_1 ; anthocyanin all medium ; mat 24 : shining green 2.

Plate 9

Silene vulgaris, P.7, plant 1, grown from seed collected at Azet, near St. Lary Hautes Pyrenées, France. $\times {}^{4}/_{5}$.

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PLATE 10

Silene vulgaris, N.204, plant 1, from P.7., plant 1 selfed. $\times 4/5$.

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Indumentum : all glabrous.

Calyx : all subinflated ; anthocyanin medium.

Corolla : petals all white, all bilobed, all 3/4 lobing, 2 small scale : 24 boss, no blotch, petals and segments all not overlapping.

Sex : hermaphrodite 9 : female 17.

Filaments and anthers : purple 9.

Stigmata : purple 17 : white 9 ; immature seeds 13 pueple.

Mature capsules : ovoid, teeth erect 14.

Mature seeds : armadillo 9.

This family showed a high degree of sterility with open pollination.

Details of individual plants used in breeding.

P.6 plant 2. Little anthocyanin in vegetative parts. Few hairs on stems, medium short hairs on leaves. Calyx inflated ; medium anthocyanin. Petals white, no blotch, petals and segments not overlapping. Anthers and filaments purple. Hermaphrodite. Stigmata purple ; immature seeds white. Capsules obloid, reflexed teeth, rather wide mouths. Mature seeds tubercled (weakly).

P.7 plant 1. Much anthocyanin in vegetative parts. Glabrous. Calyx very inflated ; much anthocyanin. Petals white, no blotch, small scale, petals and segments not overlapping. Anthers and filaments purple. Hermaphrodite. Stigmata and immature seeds purple. Capsules ovoid, teeth spreading rather wide mouths. Mature seeds armadillo.

N.204 plant 1. Much anthocyanin in vegetative parts. Glabrous. Calyx very inflated ; medium anthocyanin. Petals white, some multilobed, no blotch, small scale, petals and segments not overlapping. Anthers and filaments purple. Hermaphrodite. Stigmata and immature seeds purple. Capsules ovoid, teeth spreading rather wide mouths. Mature seeds armadillo.

N.204 plant 17. As N.204 plant 1, except petal segments overlapping.

N.204 plant 29. As N.204 plant 1, except much anthocyanin in calyx, boss, and capsules obloid-ovoid.

P.8 plant 5. Medium anthocyanin in vegetative parts. Stems glabrous, few hairs on leaves. Calyx inflated ; medium anthocyanin. Petals white, no blotch, boss, bilobed, 3/4 lobing, petals and segments not overlapping. Anthers and filaments purple. Hermaphrodite. Stigmata and immature seeds purple. Capsules ovoid, teeth spreading, and rather wide mouths. Mature seeds tubercled (weakly).

N.151 plant 5. Much anthocyanin in vegetative parts. Stems glabrous, leaves with dense short indumentum. Calyx very inflated ; medium anthocyanin. Petals white, blotch present, boss, bilobed, 2/3 lobing, petals and segments not overlapping. Anthers and filaments purple. Hermaphrodite. Stigmata and immature seeds purple.

N.12 plant 219 (see K.B. 1931, 348), from a selfiing of a plant (S.P.5) collected at Potterne, Wilts. Few hairs. Calyx subinflated ; medium anthocyanin. Petals white, no blotch, boss, petals and segments not overlapping. Filaments white ; anthers purple. Hermaphrodite and female. Stigmata white ; immature seeds purple. Capsules ovoid-obloid. Mature seeds weak armadillo.

N.186 plant 15. Medium anthocyanin in vegetative parts. Few hairs on stems and leaves. Calyx inflated ; medium anthocyanin. Petals white, no blotch, boss, petals and segments not overlapping. Anthers and filaments purple. Hermaphrodite. Stigmata and immature seeds purple. Capsules ovoid-obloid. Mature seeds armadillo.

N.186 plant 9. As N.186 plant 15 except glabrous, capsules ovoid.

Discussion.

Vegetative parts and habit. None of the plants dealt with in this paper showed any of the vegetative characters of *Silene maritima*. In P.5 there were 4 plants of strict habit, a character already recorded for British *S. vulgaris* but never for *S. maritima* (see *K.B.* 1931, plate VIII.). The leaves could all be matched in British wild material for size and shape, except those of P.7 plant 1, in which, however, the foliage agrees closely with that of some south-eastern European individuals. In two wild populations (P.6 and P.8) some plants had hairs and others were glabrous. The hairs were of a short bristly type. Glabrous plants bred completely true to this character. Families from selfings of parents with hairs have the following summated results :

N.157 (medium hairy) gave 9 hairy : 6 glabrous.
N.151 (few hairs) gave 1 hairy : 4 glabrous.
N.297 (densely hairy) gave 5 hairy : 0 glabrous.

In N.186 (and the F_2 families N.346 and N.351) hairiness was introduced with N.12 plant 219 which had few hairs. The F_1 gave 12 hairy : 38 glabrous and an F_2 from a plant with few hairs gave 18 hairy : 35 glabrous.

In N.351, two plants showed the shining or vivid green character of stems and leaves. The genes for this character were introduced in a recessive condition by N.12 plant 219 (see *K.B.* 1934, p. 383 and *K.B.* 1931, p. 350).

Anthocyanin. All parts had anthocyanin at least in some organs ; no yellow-green plants occurred. On the whole anthocyanin was fairly well developed in the plants from the Pyrenees. P.7 and P.8 had some plants with coloured petals but these were not used in selfings or the cross. In P.7 four colour classes were present (see *K.B.* 1937, pp. 481–2). Plants with white immature seeds bred true for this character (N.157) and plants for purple seeds gave only purple-seeded plants on selfing within the stocks from the Pyrenees. In N. 186 two purple-seeded plants were crossed together. The F_1 gave all purple. One F_2 family gave purple 29 : white 20 and a second F_2 family gave purple 13 : white 0.

Calyx. Amongst the plants from the Pyrenees were some with very inflated calyces. The most extreme calyx inflation, of all *S. vulgaris* plants we have ever studied in the living state, was shown by P.7 plant 1. On selfing this gave a family (N.204) of 37 plants all with very inflated calyces. Plants of N.204 selfed gave families of very poor growth, but so far as moderately good calyces were produced they were inflated. No cylindric or narrow-cylindric calyces occurred in any sample or family. When P.7 plant 1 was crossed with *S. vulgaris* with a subinflated calyx (N.12 plant 219) the F_1 had inflated and all the plants of F_2 families subinflated calyces which fitted very tightly round the mature capsules.

Corolla. The petal lobing was mostly 3/4. Only in families derived from P.8 plant 5 and in one from P.7 were petals obtained with 2/3 or less lobing. All plants had bilobed petals except 1 in N.204 and 5 in N.343. No petals had scales. In the samples grown from seeds from wild populations, 9 plants had small scales and 23 bosses. In selfings, families from parents with small scales (with the exception of N.342 with 3 scorable plants only) had a large majority of offspring with small scales, while families from parents with bosses had only offspring with bosses (except for one plant). With very few exceptions, both petals and segments were not contiguous or overlapping.

Sex. The samples from wild seed gave hermaphrodite (H) 25 : hermaphrodite and female (HF) 2 : female (F) 6. Selfings gave H 50 : HF 16 : F. 53. 33 female plants were in one family (N.342). N.12 plant 219 was hermaphrodite and female. On selfing it gave H 30 : F 20, and the F_2 gave H 24 : HF 4 : F 49.

Capsules. In the samples from wild seed both ovoid- and obloid-shaped capsules and either spreading or reflexed teeth occurred. In general plants bred true for these characters. It is important to record that capsules of obloid shape, with completely reflexed teeth and with wide mouths were produced by some plants in the samples from the wild and from selfings. Such a combination of capsule characters is typical of *S. maritima*, but also occurs in some high mountain plants from the Alps.

Seeds. Both tubercled and armadillo seeds were produced by different plants in populations from wild seed. In P.6 and P.8 the tubercled character was weakly developed and in some subsequent families from selfings the weak development of tubercles was again recorded when parents with weakly tubercled seeds were used. Nevertheless, throughout these experiments the armadillo character was fully recessive to tubercled and it must be concluded that the weak development of tubercles was due to a modification of the action of the normal dominant gene for tubercle development. Modifications of both the normal dominant tubercle and the recessive armadillo seed-coats have been previously investigated (see *K.B.* 1929, 174 ; 1931, 133 ; 1934, 388 ; 1937, 53). Modification sometimes involves a " strengthening " and sometimes a " weakening " of the character designated by our original terms for the common or " normal " appearance.

Sterility. Certain families showed sterility, in the sense of not setting capsules and seeds. Samples from wild populations were normally

fertile with open pollination. There is some suggestion that female sterility occurs as a genetically controlled factor associated with poor vegetative growth. This female sterility occurred both with controlled self pollinations and with open pollination with abundant chances of a great variety of crossings.

Summary.

Material of *Silene vulgaris* from the Pyrenees was investigated by sample populations grown from wild-collected seed, from selfings of plants from these populations, and by crossing one plant of this origin with a British plant of *S. vulgaris*. Of particular interest was the genetic behaviour of a short bristly type of indumentum, the very inflated calyx, certain characters of the capsule recalling characters usually associated with *S. maritima*, and a modification of the tubercled character of the seed-coat.

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A NEW SPECIES OF DEYEUXIA FROM PERSIA.

N. L. Bor.

Deyeuxia parsana *Bor* sp. nov., ab omnibus speciebus adhuc descriptis glumis aristatis facile distinguitur.

Gramen perenne, radicibus fibrosis, usque 50 cm. altum. *Culmi* erecti vel geniculato-adscendentes, simplices, 2-nodes, teretes, glabri, laeves vel in sulcis tenuiter scaberuli, basi innovationibus foliosis cincti et foliorum vaginis vetustis tecti. *Foliorum laminae* lineares, acuminatae, basi rotundatae, planae, virides, usque 20 cm. longae, 2 ·5 mm. latae, glabrae, leviter scaberulae, marginibus cartilagineis scabrae, summae vaginis breviores ; ligulae membranaceae, usque 3 ·5 mm. longae, oblongae, marginibus scariosis vaginarum continuae, circa culmos involutae ; vaginae striatae, internodis breviores, glabrae, scaberulae, culmos arte complectentes, marginibus scariosis.

Panicula erecta, longe exserta, coarctata, usque 8 cm. longa, 8 mm. ata ; axis primarius scaber, angulatus, nodosus ; rami breves, usque 6 mm. longi, scaberuli, adscendentes, haud ramosi, paucispiculati. *Spiculae* 5 ·5 mm. longae, breviter pedicellatae, paullo hiantes, in pedicellis scaberulis sitae, purpureae. *Glumae* inaequales (inferior 4 ·5, superior 5 ·5 mm. longa), lanceolatae, prope apices et in carinis scaberulae, ceterum laeves, 1-nerves ; nervus in aristam scaberulam 1 ·5 mm. longam productus. *Lemma* explanatum ovato-oblongum, 4 ·5 mm. longum, dorso scabrum et nervis scaberrimum, 5-nerve : nervus medius e dorso prope basin emergens et in aristam geniculatam antrose scabram 7 ·5 mm. longam productus ; nervi laterales e lemmatis apice hyalino in aristas breves purpureas producti. *Callus* barbatus. *Palea* 4 mm. longa, hyalina, explanata lanceolato-obtusa, apice erosa. *Antherae* 2 ·5 mm. longae, luteae.

Persia. Shah Zadeh Kuh, 3100 m., coll. Dr. A. Parsa. Typus in Herb. Kew.

The awned glumes of this species readily separate it from other species of *Deyeuxia* Clar. It has been named in honour of Dr. A. Parsa.

KOCHIA ODONTOPTERA AND K. IRANICA.

B. L. Burtt.

Kochia odontoptera Schrenk was described in 1843 from material collected by the author in Russian Turkestan near the R. Chu (Tschu) which flows north-west from lake Issyk Kul (42° 45′ N, 76°E). Schrenk reported that this new species occurred in two varieties, to which he referred as *prima* and *altera* without proposing varietal epithets. This step was, however, taken by Moquin-Tandon, who gave a specific diagnosis followed by β *schrenkiana* and γ *curta*, the varieties also being diagnosed. Comparison with Schrenk's original paper shows that Moquin quotes almost verbatim, and it is therefore clear that only two varieties are involved and it would have been less confusing if they had been designated α and β instead of β and γ.

" *Salsola iranica* Hausskn. and Bornm. spec. nov." appeared on a printed label of Bornmüller's 1892–93 *Iter persico-turcicum* collection (no. 5074) without description. Shortly afterwards Litwinov collected the species in Turcomania (Turkmenistan) and used the name *Kochia iranica* (Hausskn. & Bornm.) Litwin. on his labels (teste Bornmüller etc., not seen), correctly placing the species in *Kochia* as is demanded by its cyclic (not spiral) embryo.

It was not until 1908 that the name *Kochia iranica* appeared in print, in Bornmüller's Beiträge zur Flora der Elbursgebirge Nord-Persiens. Therein he discussed the generic position of the plant and also its relationship to *K. odontoptera* Schrenk, and concluded that Schrenk's first variety (var. *schrenkiana* Moq.) was the *K. odontoptera* of Litwinov's collections, and that Schrenk's second variety (var. *curta* Moq.) was *K. iranica*. Here, however, Bornmüller introduced confusion by adding after var. *curta* Moq. the words " (incl. var. α Moq.?) ". As has been noted above, there is no var. α to *K. odontoptera* Schrenk in Moquin's treatment. Bornmüller published no full description, but gave a short German diagnosis which is sufficient to validate the name as being based on his own collection, without needing recourse to validation through the synonym *K. odontoptera* var. *curta*. I propose to take Bornmüller 5074 as the lectotype of the species. The citation *K. iranica* (Hausskn. & Bornm.) Litwin. ex Bornm. is not justified in view of the fact that *Salsola iranica* Hausskn. & Bornm. was never published. Using the contraction permitted by the Rules of Nomenclature, *K. iranica* Bornm. is sufficient. Later, in 1921, Bornmüller decided that *Kochia* could not be retained as a genus distinct from the earlier *Bassia* and accordingly made the combination *Bassia iranica* (Bornm.) Bornm. This view, however, has not been accepted by later authors.

Ulbrich, dealing with *Chenopodiaceae* in the second edition of Engler & Prantl, Die Natürliche Pflanzenfamilien (1934), enumerates *Kochia iranica* (Hausskn. & Bornm.) Litwin. ex Iljin under *Kochia*, but also includes *Salsola iranica* Hausskn. & Bornm. under *Salsola* sect. *Ericoides*. The latter is clearly a slip, and *S. iranica* should be deleted, while under *Kochia* the citation should be changed to *K. iranica* Bornm. Iljin, in Komarov, Flora U.R.S.S. (1936), deals with these plants as *K. iranica*

(Hausskn. & Bornm.) Litwin. ex Bornm. and *K. schrenkiana* (Moq.) Iljin, the latter being a new combination based on *K. odontoptera* Schrenk var. *schrenkiana* Moq. On what grounds Iljin drops *K. odontoptera* Schrenk altogether is not clear. Perhaps Bornmüller's reference " (incl. var. α Moq. ?) " under *K. iranica* led to confusion, but there is no valid reason for rejecting the name and it must replace *K. schrenkiana*.

Finally mention must be made of two intraspecific epithets that have been put forward under *K. iranica*. One, β *gossypina* Bornmüller must, perhaps, be accepted as validly published (under *Bassia iranica*), but it has only the miserable characterisation " eine stärkere behaarte Form.": it is based on Bornmüller 1075 and Sintenis 1321c, but scarcely warrants recognition. The other is subsp. *pamirica* Iljin, which is not yet validly published, since it did not appear till 1936 and has only a Russian description (after 1935 a Latin description is obligatory under the Rules). Iljin's character for subsp. *pamirica* reads " The Shugnan plants are somewhat different from the typical ones in the more spreading pubescence in the upper part of the stem and more shapely (? compact) general habit."

Owing to lack of material I can give no full account of *K. odontoptera*, nor can I validate Iljin's subsp. *pamirica* of *K. iranica* ; but even now, over 50 years after its original designation as a new *Salsola*, it does not seem too late to give a formal description of *K. iranica*, for both those available (Bornmüller's in German and Iljin's in Russian) are very brief.

The two species are :—

Kochia odontoptera *Schrenk* in Bull. Acad. Sci. Petersb. 1843, 361 (excl. var. altera). *K. odontoptera* Schrenk. var. *schrenkiana* Moq. in DC. Prodr. **13**, pt. 2, 132 (1849); Fenzl in Ledeb. Fl. Ross. **3,** 749 (1851). *K. schrenkiana* (Moq.) Iljin in Komarov, Fl. U.R.S.S., **6,** 132 (1936). Type : Russian Turkestan : in locis arenosis ad flumen Chu, *Schrenk*. Distribution (ex Iljin)*: S. Transcaucasia, Aralo-Caspia, Balkash, Kara Kum, Mountain Turkmenia, Amu Darya foothills, Syr Darya foothills, Pamir-Alai.

Kochia iranica *Bornm.* in Bull, Herb. Boiss. ser. 2, **8**, 546 (1908) ; (*Salsola iranica* Hausskn. & Bornm. MS. ined., *Kochia iranica* Litwin. MS. ined.) ; O.A. & B.A. Fedschenko, Consp. Fl. Turkest. **6,** 219 (1916) ; Iljin in Bull. Jard. Bot. Acad. Sci. U.R.S.S. **30,** 364 (1932) ; Ulbrich in Engl. & Prantl, Nat. Pflanzenf. 2 Aufl. **16 c,** 535 (1934) ; Iljin in Komarov, Fl. U.R.S.S., **6,** 131 (1936). *K. odontoptera* Schrenk. in Bull. Acad. Sci. Petersb. 1843, 361 (quoad var. altera tantum). *K. odontoptera* Schrenk var. *curta* Moq. in DC. Prodr. **13,** pt. 2, 132 (1849) ; Fenzl in Ledeb. Fl. Ross. **3,** 749 (1851). *Bassia iranica* (Bornm.) Bornm. in Fedde, Rep. Sp. Nov. **17,** 276 (1921), incl. var. *gossypina* Bornm.

Herba annua, virgata, more cupressi parvae multiramosa, ramis alboflavescentibus primum breviter tomentellis demum glabrescentibus. *Folia* caulium et ramorum primariorum mox decidua, linearia, circiter 8–15 mm. longa et 1 mm. lata, apice acuta, intergerrima, breviter pilosa ;

*See W. T. Stearn, Geographical and other abbreviations in the Flora U.R.S.S. by Komarov and others : New Phyt. **46,** 61 (1947).

ea ramulorum similia sed breviora. *Flores* in glomerulos axillares foliis parvis intermixtis in ramulis dispositi. *Perianthii* segmenta sub anthesi obovata, plus minusve cucullata, extra pilosa, obtusa, 0·5 mm. longa, dorso horizontaliter carinata ; fructifera ala horizontali dorsali membranacea venosa ambitu (matura ?) plus minusve cuneata 1·5 mm. longa et 1 mm. lata aucta. *Stamina* haud visa. *Ovarium* plus minusve disciforme, 0·5 mm. diametro, breviter pilosum. *Stylus* 1 mm. longus, fere ad basin in ramos duos subulatos stigmatoso-papillosos divisus. *Semina* solitaria, horizontalia, disciformia, embryone magna peripherali ambitu ovali, medio mucilagine praedita.

Type : S.E. Iran : prov. Kerman ; Kerman in incultis, 1900 m., 20 Aug. 1892, *Bornmüller* 5074.

Distribution : S. Iran : steppe between Dehgirdu and Yezdekhast, 10 Sept. 1885, *Stapf*. N. Iran : Teheran, in incultis, 1200 m., 27 May, 1902, *Bornmüller* 8109. Transcaspia : Aschabad, in deserto salso, 13 June 1900, *Sintenis* 528 ; Aschabad, in incultis, 2 Oct. 1900, *Sintenis* 1321 c. (ex Iljin) Aralo-Caspia, Balkash, Kyzyl Kum, Syr-Darya foothills, Kara Kum, Chinese Turkestan.

Dr. J. E. Stocks' Sporobolus from Sind.—During his period of service in Sind, 1847–50, as a member of the Bombay Medical Service, Dr. J. E. Stocks collected a species of *Sporobolus* and sent it with the other plants to J. D. Hooker. This grass was taken up by Hooker and appeared in vol. **7,** Flora of British India, 249, as *S. ioclados* Nees. The distribution was given as Sind and South Africa, two areas sufficiently far apart to cast doubt upon the probability of the Sind plant being identical with the already well known *S. ioclados* Nees. As long ago as 1900 Dr. O. Stapf pointed out, in Flora Capensis **7,** 584, that " the Indian *S. ioclados* has the upper glume constantly shorter than the valve." It may be mentioned in passing that in true *S. ioclados* Nees the upper glume is equal to or slightly longer than the lemma (valve). Apart from this feature, however, the grasses are very different in appearance : the panicle branches are straight and verticillate in *S. ioclados* Nees, while they are flexuous, opposite and alternate in the Sind plant.

It appears, therefore, that a new name is required for this Indian grass, and it is proposed that the specific epithet " stocksii " be given to it in honour of its discoverer. The citation would then read **Sporobolus stocksii** *Bor* nom. nov. Syn. *S. ioclados* Hook.f. in Flor. Brit. Ind. **7,** 249, non Nees, F. Afr. Austr. 161.

N. L. Bor.

A new kind of key for plant determination.—In the majority of keys made for the determination of seed-bearing plants, characters of flowers, fruits, and seeds are given prominence. This use of the reproductive organs naturally follows from the prominence rightly given to them as providing the most satisfactory basic characters for a general classification. Characters of the vegetative parts are, of course, not ignored and, especially at the species level, are frequently used, but are most often subordinated to characters of the reproductive parts. There are, however, extremely valuable special classifications in which a selection of characters is deliberately made for special, not general,

purposes. Raunkiaer's life-form classification naturally comes to mind. The flowering and fruiting period for any given plant, or even species, is most often a limited part of one season of the year. The ecologist, the agriculturist, and the horticulturist, and often other specialists, have to follow their plants through their whole life-histories, entire or seasonal, from germination till death or dormancy. Hence the need for keys to determine plants at any stage of vegetative growth.

A key* whose general scheme is obviously of wide interest has been published recently at Tel Aviv. Unfortunately it is written in Hebrew, and the present writer is indebted to Mr. S. Duvdevani for particulars of its contents, and the following remarks are based on the data provided by this author.

The book is in the form of an analytical key to six hundred species selected from the flora of Palestine. The selection was made on the practical basis of plants of interest to agriculturists, and therefore includes plants of economic importance, especially such as have value for forage or fodder, and weeds in the broad sense of the term. Such a limitation naturally has disadvantages and contains pitfalls. Precautions were, however, taken to avoid misleading definitions of plants not included in the survey when the families and genera to which they belong were included. This was especially necessary because the keys were not arranged in an artificial manner leading directly to the species. Instead, vegetative features characterizing genera and families were sought, and to the extent to which they were found and used the key can, with modifications. be interpolated with a more general system of classification.

The underlying idea of the key is to enable any of the six hundred species to be determined at any stage of its vegetative growth under any of the habitat conditions with which it is associated in Palestine. Many difficulties had to be overcome in the preparation of the key. Place had to be found to record continuous changes such as occur in growing plants. For example, the shape of the leaves undergoes change according to the age of the individual plant. Such changes cannot be simply stated in numerical formulae. Again, habit characters depend not only on the genetic constitution but also on the environmental conditions, and the range of tolerance shown by a species may be considerable. In a book primarily intended for use by agricultural students artificial habitat conditions are very important, and these are not only very varied but often extreme in their influence. Mention need only be made of the drastic effects on plant habit of intensive grazing. It has been the intention of the authors to include in the key means of determining all the forms assumed by the selected species even when mutilated. In particular, the authors found in the botanical literature known to them very considerable gaps in the diagnosis of families and genera by vegetative characters.

The work is considered as only a small beginning. The authors are convinced that from both the practical and scientific points of view very much more use should be made of vegetative characters in floras and monographs. With this conclusion many taxonomists will agree and yet express a hope that the present Analytical Key may be translated into a language more widely used in botanical circles than Hebrew.

W. B. Turrill.

*Duvdevani, S. and Osherov, S. Analytical key for the identification of wild plants in yard, garden and field—from their leaves, stems and roots. (In Hebrew) Tel Aviv, "Am Oved," 1946, xx + 306 pages.

PLATYPTEROCARPUS, A NEW TREE GENUS OF CELASTRACEAE FROM TANGANYIKA.

H. L. Dunkley and J. P. M. Brenan.

Platypterocarpus *Dunkley et Brenan* [Celastraceae-Tripterygioïdeae. Vide clavem cl. Loeseneri in Engl. et Prantl, Nat. Pflanzenfam. 3, pt. 5, pp. 199, 212 : 1896 ; et in op. cit. ed. 2, **20b,** 107 et seq. : 1942], gen. nov.; inter genera *Tripterygioïdearum* prope *Wimmeriam* Schlechtend. genus mexicanum et centrali-americanum ut videtur ponendus, ovario (4 ?–) 5– angulato, loculis (4 ?–) 5, ovulis in utroque loculo 2, stigmatibus (4 ?–) 5, fructu magno 4–5-alato basi haud cordato facile distinguendus.

Arbor modice alta. *Folia* alterna, petiolata, elliptica usque lanceolata, crenato-serrata. *Inflorescentiae* axillares, parvae, cymosae, breviter pedunculatae, pluriflorae. *Sepala* 5, imbricata, inaequalia, libera, rotundato-orbicularia. *Petala* 5, libera, ovato-oblonga. *Stamina* 5 ; filamenta brevia, sub disci sinubus inserta ; antherae dorsifixae, rotundatae, longitudinaliter introrseque dehiscentes. *Discus* tenuis sed valde manifestus, sinubus majoribus 5 praeditus, inter sinus iterum sinuato lobatus, aliter integer. *Ovarium* 5– (? vel nonnunquam 4–) loculare, superius, sessile, basi cum disco confluens, 5– (? vel 4–) alato-angulatum ; ovula in quoque loculo 2, axi affixa. *Stigmata* 5 (? vel 4) apicalia, sessilia vel subsessilia, brevia, subcylindrica, plus minusve divergentia. *Fructus* samaroideus, indehiscens, oligospermus, alis 4 vel 5 rigide chartaceis vel subcoriaceis subsemiorbicularibus manifeste nervatis longitudinaliter affixis quam corpus fructus multo latioribus praeditus, apice emarginatus apiculatus, basi late rotundatus vel subtruncatus. *Semina* funiculo brevissimo affixa, exarillata, lateraliter compressa, elliptico-lanceolata, majuscula, testa castanea rugulosa.

Platypterocarpus tanganyikensis *Dunkley et Brenan*, sp. nov. adhuc unica.

Arbor modice excelsa, usque ad 25m. alta ; cortex sordide cinereus, ponderosus, ut videtur leviter rubro-luteo tinctus, in arboribus senioribus basin trunci versus profunde rimosus : materia saturate rubra ; rami ut videtur ascendentes (haec e sched. cl. Fletcheri) ; ramuli ultimi glabri, leviter compressi, longitudinaliter angulato-striati, vetustiores brunnei usque grisei, lenticellis muricati et longitudinaliter rimoso-sulcati. *Folia* alterna, late lanceolata, oblongo-elliptica, subovato-elliptica vel elliptica, apice angustata, obtusa vel subacuta, nonnunquam etiam obscure acuminata, basi in petiolum 0·8–1·5 cm. longum tenuem glabrum supra canaliculatum subtus rotundatum et tenuiter longitudinaliter ruguloso-striatum cuneatim vel rarius abrupte angustata et nonnunquam leviter asymmetrica, 5·5–11·5 cm. longa, 2·5–5·3 cm. lata, siccitate supra olivacea vel brunnea, nitida vel subnitida, subtus pallide olivacea vel olivaceo-brunnea, utrinque glabra, rigide chartacea vel subcoriacea, utrinque fere aequaliter sed praesertim subtus conspicue reticulata, rete venularum prominentium intricato, costa nervisque primariis utroque latere 7–9 arcuto-adscendentibus intra marginem irregulariter anastomosantibus utrinque sed prasesertim subtus exstantibus, margine grosse irregulariter crenato-serrata, dentibus inter se

0·3–1 cm. remotis obtusis et minute plus minusve apiculatis (? forsan glandulosis) 0·5–1·5 mm. altis. *Inflorescentiae* circiter 1·0–1·8 cm. longae (pedunculis inclusis) ; pedunculus 0·5–1·5 cm. longus, glaber, apice bifurcatus, ramulis divaricatis glabris congeste ac cymose iterum ramosis, ramulis ultimis bracteolatis ; bracteolae minimae, triangulares usque ovatae, 0·75–2·0 mm. longae, pallide brunneae vel plus minusve rubro tinctae, acutae vel subacutae, margine minutissime fimbriato-ciliatae, aliter glabrae ; pedicelli 1·5–2·5 mm. longi, glabri, basi bracteolati. *Sepala* inaequalia, glabra, dorso convexa, apice rotundata, margine sub lente minute laciniato-fimbriata, 2 exteriora latiora quam longiora, 1 mm. longa, 1·25 mm. lata, 3 interiora subaequalia, rotundata, 1·5–2.0 mm. diametro. *Petala* ovato-oblonga, 2·5–2·9 mm. longa, 1·75 mm. lata, apice late rotundata, nervosa, margine minutissime erosa. *Staminum* filamenta circiter 0·8 mm. longa, crassiuscula, glabra ; antherae 0·4 mm. longae, 0·6 mm. latae. *Ovarium* 0·7–1·0 mm. altum, basi 1·1–1·5 mm. latum, glabrum. *Stigmata* 0·3–0·5 mm. longa. *Fructus* (alis inclusis) 2·5–3·6 cm. longus, 2·5–4·3 cm. latus, glaber, siccitate stramineus vel rubro-brunneo tinctus ; alae medio 1·1–1·8 cm. latae, quam fructum paulo longiorae, e fructus corpore inter se subaequidistanter exstantes ; corpus fructus (alis exclusis) circiter 2–3 cm. longum, 5–8 mm. latum, subfusiforme. *Semina* circiter 6·5–9·0 mm. longa, 2·5–3·5 mm. lata, glabra, exarillata.

Tanganyika Territory. Tanga Province, Korogwe District ; Shume, 28 July 1937, *Fletcher* H 56/37 Herb. Imp. For. Inst., Oxon.). Shume and Mlifu, W. Usambaras, c. 1830 m., 2 Oct. 1936, *Fletcher* H 66/36 (type in Herb. Kew. and Herb. Imp. For. Inst., Oxon.):*—a tree up to 25 m. tall having in some cases upwards of 12 m. of clear stem, more often branching at 6 m. and upwards, branches following the line of the stem rather than spreading outwards ; bark of a dirty greyish colour, apparently having a slightly reddish-yellow tinge, in the older trees near the base and in the thicker part of the bole fissured with deep cracks about 5–10 cm. apart ; the wood is a deep red and, when cut into boards, cups very badly in drying : it may be all right if seasoned in the log ; in transition zone between wet and dry forest, mainly associated with *Cassipourea elliottii*, *Fagaropsis angolensis*, *Catha edulis*, *Calodendrum eickii*, *Rawsonia usambarensis*, *Bersama holstii* and *Ochna holstii* ; vernacular name (Kishamb.) " Mwandama mwanamume." *Shume*, W. Usambaras, 1830 m., 4 Aug. 1936, *Greenway* 4617 (young and apparently mature fruits, in Herb. Imp. For. Inst., Oxon) :—evergreen forest tree up to 18 m. tall with winged fruits, growing in *Podocarpus*, *Juniperus procera*, *Ocotea usambarensis*, *Ficalhoa* forest on a grey sandy soil ; fairly common : vernacular name same as above.

The occurrence of an endemic genus of *Celastraceae* in Tanganyika Territory is somewhat unexpected, for, although the family is well represented in the Territory, the species appear to belong to genera with a more or less wide distribution in Africa ; indeed, this seems to apply to most of the tropical African *Celastraceae*. The phytogeographical relationships of the Tanganyika flora, however, are not infrequently surprising.

* Also bark specimen.

When in flower, *Platypterocarpus* has a distinct resemblance to certain species of *Gymnosporia* and, on a merely superficial examination, might be assumed to belong to that genus. On dissection, however, the sharply angled ovary, the larger number of stigmas and loculi, as well as other characters, should arouse suspicion. In fruit our genus differs *toto caelo* not only from *Gymnosporia* but from all other African *Celastraceae* known to us. The fruits have a considerable resemblance to those of the larger fruited species of *Combretum*, and an even more striking similarity to those of the West Tropical African Lecythidaceous genus *Combretodendron* ; in both these genera the fruit is, of course, inferior. Many of the fruits of *Platypterocarpus* examined by us are detached from their parent inflorescences and appear to be quite ripe, yet in none are there any signs of regular dehiscence. A slight irregular crack is sometimes visible in the angle between adjacent wings which may be due to pressure during drying, but in no instance does it expose the seed or even the loculus. It therefore seems highly probable that the seeds are not liberated from the fruit until after the latter has been dispersed from the parent tree (presumably by wind, as the fruits are fairly light). The collector does not state whether any of the fruits collected had already fallen, but the large number of detached fruits suggests the possibility. Typically the fruits are five-winged but a few four-winged ones have been seen. Unfortunately, we have not seen corresponding flowers to these. Probably in such instances the ovary is 4-locular and 4-angled.

The placing of this remarkable genus in its correct position in *Celastraceae* presents some difficulty. The combination of characters is such that it does not fit readily into any of the existing subdivisions of the family. Nor has any very close affinity been found among individual genera. The principal characters adopted by Loesener (in Engl. and Prantl, Nat. Pflanzenfam. ed. 1, **3,** pt. 5, 199 et seq. : 1896) for separating the subfamilies are taken from the fruit and the presence or absence of an aril. The treatment of the subfamilies by the same author in the second edition (*op. cit.* ed. 2, **206,** 107, et seq.: 1942) is essentially similar to that in the first, with the addition of the subfamily *Campylostemonoïdeae*, created to accommodate the genus *Campylostemon* after transference from *Hippocrateaceae*. This subfamily, however, differs very widely from our plant in habit, opposite leaves, inflexed stamens, anthers with transverse dehiscence, trimerous gynoecium, etc. ; it seems certain that there is no close affinity here.

The *Goupioïdeae* contains the single S. American genus *Goupia* Aubl., whose fruit is a berry, and which need not be further considered here. The *Cassinioïdeae* have usually no aril and contain certain genera with indehiscent capsules. In these genera the wingless capsule is rounded in section and shows no evident angles : the prevalence of basal or apical ovules also militates against an affinity being found here. We do not consider that our genus has any close relationship with this subfamily. In the *Celastroïdeae* dehiscent capsules are prevalent and are correlated with the presence of an aril. Indehiscent or tardily dehiscent capsules are found in *Kurrimia* Wall. and *Kokoona* Thw., which shows no close affinity to *Platypterocarpus* in any other characters, and which in addition possess either an aril or a wing which may be of arillar origin.

Loesener (in Engl. Bot. Jahrb. 39, 168–169 : 1906) establishes and discusses at some length a new genus *Peripterygia* (Baill.) Loes., with a single species from New Caledonia : he admits some resemblance to the *Tripterygioideae*, but refers it to the *Celastroideae*. Loesener, while admitting the possibility of the wing having an arillar origin, does not venture to make any definite decision. *Peripterygia*, of which we have unfortunately seen no material, shows, from Loesener's description, certain points of resemblance to *Platypterocarpus* ; the stamen filaments are inserted below the disc, the ovary is angled, there is no style, and the capsule is obcordately winged. It differs from *Platypterocarpus* in the possibly dioecious flowers, in the anthers being about as long as the filaments, in the three-angled ovary, in the capitellate stigma, and in the smaller fruits, which are slightly dehiscent and have only three wings. Great importance should be attached also to the winged seeds, which seem to have been one of the principal factors inducing Loesener to place *Peripterygia* in the *Celastroïdeae* rather than in the *Tripterygioïdeae* (see also Loesener in Notizbl. Bot. Gart. Berl. 13, 220–221 : 1936). In our opinion, the points of difference outweigh in importance those of resemblance. There remains to be considered the *Tripterygioïdeae*. This group is characterised, among other things, by indehiscent winged fruits and absence of aril ; so far there is agreement with our plant. On the other hand the ovary is normally only 2–3-locular and the fruit 1–3-winged. Among the genera of this group, *Wimmeria* Schlechtend. from Mexico and Central America is the only one showing any affinity in the fruit, but even here that affinity does not appear to be very close. *Wimmeria* has the additional point of resemblance (not shared by other genera of the subfamily) that the ovules are axile and not erect. They are, however, more numerous, being 4–8 in each loculus. Lundell has recently described (Bull. Torr. Bot. Club, 65, 467 : 1938) *Wimmeria bartlettii*, a new species from Guatemala and British Honduras, in which the ovary loculi and fruit-wings are usually 3, rarely 4 ; in this character an approach is shown to *Platypterocarpus*, where 4 wings (and probably 4 loculi) are found abnormally. Of the other genera, *Tripterygium* Hook. f. has three-winged fruits, one-seeded and unilocular (by suppression of the other two loculi present in the ovary), and also has two ovules per loculus, a character shared by the other genera of the sub-family, except *Ptelidium* with one ovule per loculus, and *Wimmeria* already mentioned.

In conclusion, the points of disagreement shown by *Platypterocarpus* appear to be fewer and of less taxonomic importance here than in the other subfamilies, and we propose that it be placed here in the neighbourhood of *Wimmeria*. It may be noted that this is the first record from continental Africa of this subfamily, which otherwise has a wide and discontinuous distribution in Madagascar, eastern Asia, Mexico, and Central and South America. It is noteworthy that *Ptelidium* from Madagascar, which of this group of genera is the closest geographically to *Platypterocarpus*, appears to be the least closely related. The affinity of *Platypterocarpus* with *Wimmeria* may perhaps be looked upon as adding yet one more to those numerous links of relationship that extend across the Atlantic Ocean between the floras of Africa and America.

THE WOOD STRUCTURE OF SENECIO MERUENSIS COTTON AND BLAKELOCK.

E. M. Slatter.

The anatomy of the woody Senecios from Kilimanjaro has been investigated by Hare (2), who approached the subject mainly from the ecological standpoint, and Hauman (3), whose short description agrees with the observations recorded in the following article. Neither of these investigators devoted much attention to the structure of the secondary xylem, and, indeed, no detailed account of the wood structure of those species of *Senecio* possessing what Cotton (1) has termed the megaphytic habit appears to have been published. In view of the taxonomic value of the microscopical structure of the secondary xylem and the interest of the structure of the woody members of genera, like *Senecio*, which consist mainly of herbs, it seemed worth while to take the opportunity to describe the authentically named material of *Senecio meruensis*, a species described by Cotton and Blakelock in Kew Bull. 1947, p. 135.

In a general way the wood resembles that of the species of *Senecio* examined by Hare (2). In physical properties it is moderately soft and moderately heavy with a fine and even texture. The colour when freshly sawn is whitish-yellow, darkening on exposure.

(i) *Macroscopic Features.*

Bark thick, rugged, deeply folded longitudinally; covered by epiphytic moss. Remains of many leaf bases with remnants of fibrous vascular bundles attached to the branches. *Growth rings* very indistinct. *Vessels* visible to the naked eye, numerous, evenly distributed. Vessel lines visible on longitudinal surfaces. *Soft tissues* not visible. *Rays* fine, numerous, conspicuous on end and radial surfaces, not so obvious on the tangential surface; lighter in colour than the remaining ground tissue. *Ripple marks* and *secretory canals* absent.

(ii) *Microscopic Features.*

Growth rings indistinct; infrequent in trunk wood, but more numerous in branches. Several rings visible in branches of 2½ inches diameter; the boundary marked by a layer of slightly wider fibres with thinner walls, 6–10 cells wide.

Vessels (Figs. J–P) evenly distributed, seldom in contact with rays; number of solitary vessels and vessel groups 7–18 (mean 12) per sq. mm. Solitary, but mostly in radial multiples of 2–8 and irregular clusters of up to 15. Tangential diameter of solitary vessels 79–143 (mean 98) μ, oval to circular in cross section. Elements very short, 63–444 (mean 242) μ long, with or without short tails, perforations horizontal to oblique (mostly horizontal in the oldest wood), simple; vertical walls thin. Gum-like deposits very rare in the vessels of the youngest but abundant in those of the oldest, partly decomposed wood at the centre of the trunk. Tyloses absent. Intervascular pits abundant, alternate, large, evenly distributed. Pits appearing oval to circular or angular according to the focus, with large slit-like to oval, horizontal to oblique, included apertures; apertures rarely confluent. Vessel-parenchyma pits numerous, smaller

than the intervascular pits, with circular apertures. Vessel-ray pits infrequent, small, similar to the intervascular pits.

Fibres (Figs. A–I). Individual elements much wider in the middle than towards the pointed or forked ends of each cell; elements very short, 254–937 (mean 636) μ long, diameter at widest part 16–48 (mean 32) μ. Width of lumina approximately twice the width of the wall. Pits in radial and tangential walls numerous, moderately small, inconspicuously bordered ; apertures slit-shaped to oval, approximately vertical to slightly oblique.

Parenchyma not very abundant, mostly as uniseriate complete or incomplete paratracheal sheaths ; rarely diffuse (strands 2 cells deep in tangential section). Cells oval to rectangular in transverse section. Pits abundant, very variable in size, larger ones solitary, smaller ones in clusters, inconspicuously bordered ; apertures circular to oval.

Rays (Figs. Q–U) 2–4 (mean 3) per mm. ; 2–9 cells wide, 3–30 (mostly 12–20) cells high. (In oldest wood and in branches up to 47 cells high—Fig. U.) Width 63–190 (mean 127) μ. Heterogeneous. In tangential section inner cells small, circular to oval ; sheath cells large, elongated, oval to rectangular. (In oldest wood and in branches of 3–4 years growth this differentiation is not so marked—Fig. U.) Marginal cells 3 times as high as inner cells in radial sections ; inner cells procumbent, 2–7 times as wide as high. (In oldest wood and in branches marginal cells twice as high as inner cells ; inner cells 2—5 times as wide as high.) Marginal cells upright, almost square or slightly higher than wide. No intercellular spaces. Tangential walls vertical. Pits in all walls abundant, moderately small, inconspicuously bordered ; apertures circular to oval.

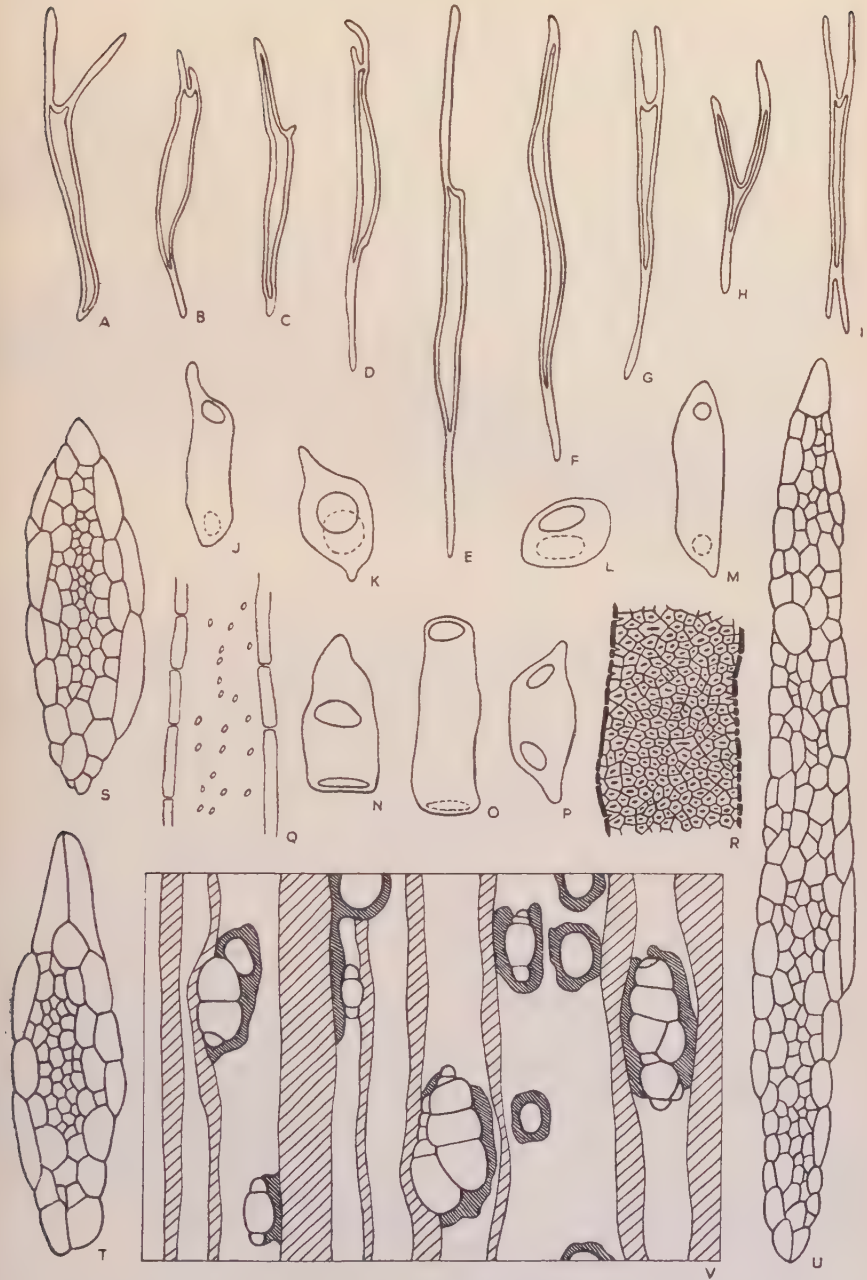
Material examined.

Trunk wood : No. 4004, Mt. Meru, Tanganyika. Collected by B. D. Burtt.

Branch wood : No. 7801, Mt. Meru, Tanganyika. Collected by P. J. Greenway.

References.

1. Cotton, A. D. " The megaphytic habit in the tree Senecios and other genera ", in Proc. Linn. Soc. 156th Sess. 158, 2 (1944).
2. Hare, C. L. " The Arborescent Senecios of Kilimanjaro : a study in Ecological Anatomy ", in Trans. Roy. Soc. Edin., **60,** 2 (No. 10), 355 (1940–41).
3. Hauman, L. " Les Senecio arborescents du Congo ", in Rev. Zool. Bot. Afric. **27** (1935).



A–I, Fibres, showing range in length and shape (pits not indicated). J–P, Vessel elements, showing range in length and shape ; J and K from branch wood (pits not indicated). Q, Portion of a fibre to show pits. R, portion of a vessel to show pits. S–U, Medullary rays in tangential section (U from branch wood). V, Tangential section of mature wood (rays shown by coarse cross-hatching, parenchyma by fine cross-hatching). A–P × 74, Q × 400, R × 225, S–U × 94, V × 50.

PRINTZIA POLIFOLIA (*Linn.*) *Hutch.*

A. A. Bullock.

In the course of work on a new flora of the Cape Peninsula, Mrs. Levyns had occasion to question the synonymy of *Printzia bergii* Cass. (1826) as defined by Harvey (1865) in the *Flora Capensis*. Harvey quotes two synonyms having earlier specific epithets, namely *Inula cernua* Berg. (1767) and *Leyssera* (sic) *polifolia* Thunb. (1800), and notes that Linné had placed the species in the genus *Aster*. He did not give Linné's specific epithet or the place of publication.

The name of the species under *Aster* is *A. polifolius* Linn. (1763) and it is clear that this epithet must be used under *Printzia* provided there is no preoccupation of the name. This was evidently overlooked by Druce (1917) when he made the combination *Printzia cernua*.

On consulting the specimens in the herbarium at Kew I found that many of them had been written up by Dr. J. Hutchinson, F.R.S., as " *Printzia polifolia* Hutch.," and in one case he had added the synonym " *Aster polifolius* Linn." Dr. Hutchinson informs me that this was done many years ago and his recollection of the matter is somewhat vague. In publishing the name (1946), however, he gives " (Thunb.) " as the original author of the epithet and cites " *P. bergii* Less." as a synonym.

I have examined the specimen of *Aster polifolius* in the Linnean herbarium and find it to be identical with the *Printzia bergii* Cass. of the *Flora Capensis*. In particular, it is an excellent match, in appearance and condition, of a specimen at Kew collected by Dr. H. Bolus (No. 9881) at Houw Hoek. For an examination and photographs and for a small portion of the material of *Leysera polifolia* in Thunberg's herbarium I am deeply indebted to Professor Nannfeldt and Dr. R. Santesson of Uppsala. The photographs are reproduced in plate 11. The variation in the leaf margin and leaf shape, to which Dr. Santesson (*in litt.*) calls my attention, is matched by the specimens at Kew, and there are a number of specimens showing a very complete range from one to the other. There is no doubt that Thunberg's plant is conspecific with the Linnean type, and his labelling of one of his specimens makes it clear that he was in fact making a new combination *Leysera polifolia*, based on the Linnean *Aster polifolius*, when he published the name in 1800. Dr. Hutchinson's " (Thunb.) " must be regarded, therefore, as a typographical error for " (Linn.) ". The relevant synonymy is as follows :—

Printzia polifolia (*Linn.*) *Hutch.* Botanist in Southern Africa, 91 (1946).

Aster polifolius Linn. Sp. Pl. ed. II. 1224 (1763).

Inula cernua Berg. Descr. Pl. Cap. Bon. Spei, 288 (1767).

Leysera polifolia (Linn.) Thunb. Prodr. P. Cap. 161 (1800), et F. Cap. ed. Schultes, 692 (1823) ; Juel, Pl. Thunb. 363 (1918).

Aster papposus Willd. ex Spreng. Syst. **3**: 525 (1826).

Printzia bergii Cass. in Dict. Sc. Nat. **43** : 324 (1826) ; Less. Syn. Gen. Comp. 108 (1832) ; DC. Prodr. **7** : 13 (1839) ; Harv. in Harv. et Sond. Fl. Cap. **3** : 513 (1865).

Plate 11

(a) (b)

Printzia polifolia (Linn.) Hutch.— Specimens in Thunberg's herbarium ; (a) shows the *Aster* and *Inula* synonyms whilst both (a) and (b) show the *Leysera* synonym with the single " s " spelling.

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Aster chamaedryfolius Lam. ex DC. Prodr. **7** : 13 (1839), in syn.

Printzia cernua (Berg.) Druce in Rep. Bot. Exch. Club Brit. Isles, 1916, 642 (1917).

A further synonym, recorded on one of the sheets in Thunberg's herbarium, is *Inula caerulea* Linn. This is quoted by De Candolle (1839) as being published by Linné in the " *Mantissa*," page 147, and the *Index Kewensis* gives it in " Linn. Mant. ii. 471." It does not appear at either place and there is no specimen so named in the Linnean herbarium. A further brief search in the Linnean works has failed to reveal the place of publication but it seems certain that it did not appear prior to 1763.

There is no indication on the sheet in the Linnean herbarium of the source of the specimen of *Aster polifolius*. In the *Species Plantarum*, however, Linné gives " *Habitat ad* Cap. b. spei. *Burmannus*," showing that he obtained the specimen from Burmann, who had numerous correspondents at the Cape.

The genus *Leysera* was named by Thunberg in honour of the contemporary botanist Leysser. It seems that Thunberg *deliberately* dropped one " s " in making the generic name and there is therefore no justification for the " correction " made by later authors.

A NOTE ON PARABOEA.

B. L. Burtt.

In 1940 the late Dr. A. F. G. Kerr asked me to determine a few Siamese *Gesneriaceae* collected by Mr. H. B. Garrett. These were found to include a new species of *Paraboea*, and the drafting of a brief note on the genus was begun. Under the prevailing circumstances, however, it was not possible to complete this, and only a bare description of the new species was published (*Paraboea glabrisepala* B. L. Burtt in Kew Bull. 1941, 21).

Ridley was only dealing with the species native to the Malay Peninsula when he established the genus *Paraboea* (Journ. As. Soc. Straits Branch, **44**, 4 & 62 : 1905). He did not, therefore, mention by name any of Clarke's original species of *Didymocarpus* sect. *Paraboea*, but his genus was clearly based on Clarke's section for he said "the genus was amalgamated with *Didymocarpus* by Clarke, but should certainly be kept separate." This remark may be held to justify the selection of a lectotype for the genus not from amongst Ridley's species, but from the species originally placed in *Didymocarpus* sect. *Paraboea* by Clarke. Of these, 5 in number, none is particularly indicated as lectotype on botanical grounds. It is, therefore, reasonable to propose *D. paraboea* C. B. Cl., which gave its name to the section, as the lectotype of the genus. Unfortunately on transfer to *Paraboea* it requires a new specific epithet to avoid the formation of a tautonym ; *Paraboea clarkei* B. L. Burtt is proposed.

Ridley recognised two sections within the genus. The first, *Breviflores* (a name he later unwarrantably changed to *Eu-Paraboea*), was characterized briefly as " corolla tube very short." This is where *P. clarkei* belongs, and the correct sectional name is *Paraboea* sect. *Paraboea* (C. B. Cl.) B. L. Burtt.

Ridley's second section, *Campanulatae*, was simply characterized as

" corolla campanulate " and it is therefore proposed to take as the lectotype of this section *P. campanulata* Ridley. This section is perhaps more closely allied to *Didymocarpus* sect. *Kompsoboea* than to *Paraboea*, *sensu stricto*. A decision on this matter, however, must await a study of the circumscription of *Didymocarpus* : for the time being, therefore, sect. *Campanulatae* is retained in *Paraboea*.

Paraboea (*C. B. Clarke*) *Ridley* in Journ. As. Soc. Straits Branch, **44**, 4 & 62 (1905), et in Journ. As. Soc. Bengal, **74**, 771 (1909), et in Fl. Malay Penins. **2**, 527 (1923).
Didymocarpus sect. *Paraboea* C. B. Clarke in DC. Monogr. Phan. **5**, pt. 1, 105 (1883).
Sect. 1. **Paraboea** (*C. B. Clarke*) *B. L. Burtt*, comb. nov.
Didymocarpus sect. *Paraboea* C. B. Clarke l.c.
Paraboea sect. *Breviflores* Ridley in Journ. As. Soc. Straits Branch, **44**, 64 (1905) ; et in Journ. As. Soc. Bengal, **74**, 770 (1909).
Paraboea sect. *Eu-Paraboea* Ridley, Fl. Malay Penins. **2**, 528 (1923).

The new names required in this section are ;—
Paraboea clarkei *B. L. Burtt*, nom. nov. *Didymocarpus paraboea* C. B. Clarke in A. & C. DC. Monogr. Phan. **5**, pt. 1, 106 (1883).
P. schefferi (*Forbes*) *B. L. Burtt*, comb. nov. *Didymocarpus schefferi* Forbes in Journ. Linn. Soc. Bot. **19**, 298 (1882).

P. minahassae (*Teysm. et Binn.*) *B. L. Burtt*, comb. nov. *Boea minahassae* Teysm. et Binn in Batav. Tijdsch. **25**, 17 (1863). *Didymocarpus minahassae* (Teysm. et Binn.) Forbes in Journ. Linn. Soc. Bot. **19**, 298 (1882).
Sect. 2. **Campanulatae** *Ridley* in Journ. As. Soc. Straits Br. **44**, 63 (1905) ; et in Journ. As. Soc. Bengal, **74**, 770 (1909) ; et in Fl. Malay Penins. **2**, 528 (1923).
Lectotype of section, *P. campanulata* Ridley.
I refrain from making new combinations for *Didymocarpus* (§*Paraboea*) *alternifolia* C. B. Clarke and *D.* (§*Paraboea*) *detergibilis* C. B. Clarke as I have seen no material of these plants.

Pomatocalpa ramosum (*Lindl.*) *Summerhayes*, comb. nov.
Saccolabium ramosum Lindl. Gen. & Sp. Orch. 224 (1833).
Cleisostoma ramosum (Lindl.) Hook. f. Fl. Brit. India, **6**, 72 (1891).

Material of the above species was recently included in a small collection of orchids, from the Cox's Bazaar district some distance south of Chittagong in Bengal, which were submitted for determination to Kew.

A great deal of research has been carried out on the Asiatic monopodial orchids during the last twenty or thirty years, so that we now have a fairly clear idea of the various genera and their circumscription. Most of this work, however, has been done on Malayan species and the general results have as yet not been applied in detail to the Indian representatives of the genera concerned.

Since the genus *Cleisostoma*, in which the above species was included by Hooker, can no longer be maintained, I am transferring the species to *Pomatocalpa* of which genus it possesses the characteristic floral structure.

V. S. Summerhayes.

NEW PLANTS FROM INDIA AND BURMA.

D. CHATTERJEE.

Delphinium conocentrum *Chatterjee* sp. nov. (*Ranunculaceae*) ; *D. viscoso* Hook f. et Thoms. similis sed pedunculo paucifloro, bracteis lobatis, calcari multo latiore recto, ovario omnino piloso facile distinguendum.

Herb, 13–30 cm. long. Young stem minutely tomentose, older part glabrescent and fistular. *Leaves* radical and cauline, long-petioled, reniform, 3–5 lobed, base with medium to wide sinus, palmiveined, hairy on both surfaces, lamina 5–8 cm. in diam., petiole 9–18 cm. long, flattened near the base, sub-amplexicaul, tomentose to thinly hairy. *Inflorescence* few-flowered usually 1–2 fls. (rarely 3–4), pedicel 3–8 cm. long, bracts leaf-like, lobed. *Flowers* globose, 3 cm. in diam., about 4·5 cm. long including the spur. *Sepals* 5 free, petaline, unequal, dorsal larger and with a spur, thinly and distinctly multiveined, veins anastomosing freely, hairy with yellow-brown hairs, spur broadly conical, straight, 12–15 mm. long, 6–8 mm. wide ; other sepals broadly ovate, hairy, veined, 24 mm. long, 20 mm. wide. *Petals* 3, small and narrow, thinly hairy, two dorsal ones spurred, the spurs included in the cavity of the sepal-spur. *Stamens* many, filaments glabrous, flattened near the base, anthers ellipsoid, bilobed. *Carpels* 3 free, ovary elongate-ovate, hairy all over, more so on the upper half, style short, filiform, stigma simple, carpel 8 mm. long, 2 mm. wide. *Young follicles* 14 mm. long, 5mm. wide, hairy throughout ; *mature fruit* not seen.

EAST HIMALAYA. Sikkim : Jongri to Aloktong, alt. 4500 to 5000 m., 9th October, 1862, *T. Anderson* 345 (type)*; without precise locality, alt.4000 to 4300 m., October, 1857, *T. Thomson* without number ; March, 1877, *Elwes* without number. Bhutan : Punkala, alt. 4800 m., 1st August, 1938, *B. J. Gould* 1300.

NEPAL. Shebal Joong, alt. 5300 m., 5th September, 1927, *Sir Clive Wigram* 112.

This is a very distinct plant and apparently resembles *Delphinium viscosum* Hook. f. & Thoms. It differs in having a fewer-flowered inflorescence, globose flowers, lobed bracts, much broader spur (6–8 mm. compared with 3–4 mm. of *D. viscosum*) and ovary which is hairy throughout.

Stauntonia racemosa *Chatterjee* sp. nov. (*Lardizabalaceae*) ; *S. filamentosae* Griffith arcte affinis, sed foliolis angustioribus, venatione indistincta, racemis evolutioribus, staminibus liberis distincta.

Climber (?), stem terete, glabrous, somewhat glaucous in the younger parts. *Leaves* long-petioled, digitate, with five leaflets ; petiole 15 cm. long ; leaflets elongate lanceolate, base cuneate, apex acuminate, margin entire, glabrous, veins rather indistinct, lamina of leaflet 6 cm. long, 1·8 cm. wide (in young leaflets), petiolule 1·5–4 cm. long. *Inflorescence* axillary, of 4–6 equally developed spreading racemes, 9–14 cm. long,

*Unless otherwise stated all the type sheets described in this paper are in Herb. Kew.

arising from the axil ; bases of the racemes covered with a number of coriaceous broadly deltoid scales (bracts). *Flowers* unisexual, pedicelled, glabrous, ellipsoid in bud, pedicel 4–5 mm. long, lanceolate, bracts 2–4 mm. long. *Male flowers* only known. *Sepals* 6 free, biseriate, outer 3 sepals ovate-elongate, obscurely acute, distinctly 6–8-nerved, 9 mm. long, 3–4 mm. wide ; inner sepals smaller than, and alternating with the outer, lanceolate, 4–5-veined, apex subacute, 7 mm. long. *Petals* absent but represented by six free minute nectaries, obovate with mucronulate apex, less than 1 mm. in diam. ; the nectaries are attached to the base of the free stamens. *Stamens* 6 free, arranged in one whorl, distinctly extrorse, filament smaller than the anthers ; anthers bilocular, extrorse linear, elongate, attached on the dorsal side of the well-developed connective, which is produced into an apiculate end. Stamens 7–8 mm. long including the apiculate tip. *Pistillodes* 3, free, linear, about 2 mm. long. *Fruit* not seen.

Burma : Upper Burma ; Kaitao, 460 m., February, 1912, *S. M. Toppin* 4401 (type).

This plant resembles *Stauntonia filamentosa* Griffith in general features, inflorescence, and leaves, and differs only in having free stamens. Free stamens are characteristic of the genus *Holboellia* but the specimen is very different from that genus. *Stauntonia filamentosa* Griffith was treated as synonymous with *Holboellia latifolia* Wallich until Hemsley, in *Hook Icones*, t. 2845 (1907), restored it as a distinct species. The new *Stauntonia* described here resembles Griffith's *S. filamentosa* so well that transference of this plant to *Holboellia* on the ground of its free stamens alone would be a very artificial and unnatural change. Another case where such a union of characters of the two genera *Stauntonia* and *Holboellia* is noticed is found in *Stauntonia formosana* Hayata (Icon. Pl. Formosanorum **8,** 1.) where the author himself has pointed out in the footnote this interesting fact. Besides these, there are a number of other intermediates which show that *Holboellia* cannot stand as a natural and distinct group apart from *Stauntonia* DC. and *Parvatia* Dcne. In my opinion the generic limits of *Stauntonia* DC. should be slightly modified to accommodate all the species of *Holboellia* and *Parvatia*.

Fissistigma bracteolatum *Chatterjee* sp. nov. (*Annonaceae*) ; *F. minuticalyci* (McGregor et W. W. Smith) Chatterjee* floribus fasciculorum numerosis et facie *F. polyantho* (Hook f. et Thoms.) Merrill similis. Ab ambobus bracteis basalibus numerosis, conspicuis, pedicellis crassioribus, carpellis numerosioribus differt.

A powerful woody climber, about 10 m. long. Branchlets terete, brown-tomentose, older parts glabresent or glabrous. *Leaves* petioled, ovate-oblong to elliptic-oblong, base narrowed, apex abruptly ending in a cuspidate point, margin entire and reflexed in older leaves, primary nerves 16–18 pairs (rarely 20) running into the margin at regular intervals; midrib and nerves shallowly channelled above and distinctly raised below, lamina 12–17·5 cm. long, 4–7·8 cm. wide, glabrous on the upper surface except on midrib and veins, coriaceous, lower surface rufous-

*__Fissistigma minuticalyx__ (*McGregor et W. W. Smith*) *Chatterjee* comb. nov. (*Melodorum minuticalyx* McGregor et W. W. Smith in Rec. Bot. Surv. Ind. **4,** 274 : 1911)

tomentose ; petiole 12 mm. long, tomentose. *Inflorescence* in leaf-opposed fascicles of 8–14 flowers in each, common peduncle 3–7 mm. long, pedicels 10–15 mm. long, yellow-tomentose. Bracts usually basal, elongate-ovate, acute, 5–6 mm. long, 3–4 mm. wide, rufous-pubescent outside, glabrous and minutely gland-dotted within, bracteoles slightly smaller than the bracts. *Sepals* 3, broadly ovate, acute or sub-acute, pubescent outside glabrous within, 5 mm. long, 3–4 mm. wide. *Petals* 6, biseriate, sub-equal, thickly coriaceous ; outer petals elongate-ovate 13 mm. long, 7 mm. wide, acute to sub-acute, yellow pubescent outside ; inner petals 10–11 mm. long, 4–5 mm. wide, glabrescent outside, glabrous within. *Stamens* many, anthers linear, connective swollen at the end and obliquely and roughly triangular, stamens 1·5 mm. long. *Carpels* 14–16, linear, about 3 mm. long, ovary strigose with golden brown hairs, style short, stigma obscurely bilobed ; both style and stigma very thinly hairy. *Torus* sub-globose with indentation marks. *Ripe carpels* not seen.

Burma. North-east Burma, lat. 26° 15′ N., long. 98° 35′ E., alt. 2000 to 2300 m., *Forrest* 26562 (type) ; Myitkyina District, below Kangfang beside Ngawchang Hka, *C. W. D. Kermode* 17309.

South-west China. Yunnan ; Szemao, alt, 1900 m., *Henry* 11646.

There is one fruiting specimen from Burma (*Lace* 5144) which strongly resembles this species and might belong to it. The ripe carpels are about 12 in number, golden tomentose, globose with mucronate apices, each ripe carpel about 11 mm. in diam. Henry and Kermode have given the habit of the plant as climber, but Forrest referred to the habit as " Shrub 30 feet." Forrest's specimen exactly matches with Henry's 11646 and it is more probable that Forrest had a scandant plant.

Saccopetalum tectonum (*Hutchinson ex Parkinson*) *Chatterjee* comb. nov. (*Annonaceae*) ; *S. horsefieldii* Benn. facie affinis, sed foliis majoribus, glabris, basi saepe cordatis, petalis angustioribus longioribus, staminibus minus apiculatis differt.—*Miliusa tectona* Hutchinson ex Parkinson, For. Fl. Andamans 75 (1923).

Tree, 13–27 m. high (vide Parkinson). Branchlets glabrous throughout, lenticellate, finely furrowed and wrinkled. *Leaves* shortly petioled, ovate to elliptic-oblong, acutely or obtusely acuminate, base rounded and often shallowly cordate, margin entire ; primary nerves 12–14 pairs, midrib shallowly channelled on the upper surface, lamina 10–15 cm. long, 4–6cm. wide, glabrous, coriaceous ; petiole 2–4 mm. long, rather dark in colour. *Flowers* usually solitary or in pairs, usually borne from the axillary positions of fallen leaves. Pedicel 10–15 mm. long, slender adpressed pubescent, bracteoles (not seen) apparently very caducous. *Sepals* 3, valvate, ovate-lanceolate, hairy and minutely gland-dotted on both surfaces, sub-acute, thinly and finely many-nerved, 6–7 mm. long, 2·5–3 mm. wide. *Petals* 6, biseriate ; outer series sepaline, valvate, hairy and gland-dotted like the sepals, 8–10 mm. long, about 3 mm. wide ; inner petals much larger, ovate-lanceolate with saccate bases, sub-acute to obtuse, softly and minutely pubescent outside, thinly hairy within, many-nerved (about 12), petals 3–3·5 cm. long, 10–11 mm. wide. *Stamens* many, arranged in 4–5 series, anther lobes 1 mm. long, con-

spicuous and gently arching, connective obscurely apiculate. *Carpels* about 20, narrowly ovoid, 1·5–2 mm. long, ovary densely hairy, stigma sub-globose, rugulose, ovules 4–7 in each carpel. *Torus* elongate-ovoid, obtuse, hairy. *Fruit* not seen.

Andaman Islands. Middle Andamans, *C. E. Parkinson* 545 (type) ; Rutland, *C. Alfred* 211.

This tree appears to yield a good timber in the Andamans and is commonly called "Jungle teak" or "*Jungli Segun*" in Hindi. It resembles the real teak (*Tectona grandis* Gaertn. f.) by its stem and bark as stated by Parkinson. This might have suggested the specific epithet. Unfortunately the description given by Parkinson (l.c.) is inadequate and the number of ovules in the carpels was not stated. A re-examination of the material and a section of the ovary revealed that the plant is a *Saccopetalum* and should be transferred from *Miliusa*. It was also found necessary to give a fuller description.

Bennett has discussed fully the grounds on which the genus *Saccopetalum* was based (Pl. Java. Rar. 165, 1840), and this plant from the Andamans agrees fairly well with his type species *Saccopetalum horsefieldii* Benn. It differs from the latter by having larger, glabrous and often cordate leaves, narrower and longer petals and the characteristic stamens.

Stachyurus coaetaneus *Chatterjee* sp. nov. (*Stachyuraceae*) ; *S. himalaico* Hook. f. & Thoms. arcte affinis sed foliis magis elongatis, nervis primariis procul a margine conspicue arcuato-anastomosantibus, margine subdeflexo patulo-serrulato, rhachi inflorescentiae basi graciliore, floribus cum foliis coaetaneis, petalis latioribus, ovario glabro differt.

A shrub. *Stem* terete, glabrous, slightly uneven with distinct and well developed pith. *Leaves* shortly petioled, alternate, ovate-elongate, base subcordate, apex long-acuminate, margin finely serrate, serration slightly deflexed outwards. Midrib distinct on both surfaces, slightly raised on the upper surfaces, more so below ; primary nerves 6–7 pairs, at first diverging from the midrib at regular intervals but subsequently converging much below the margin (near two-thirds distance) and joining the next pair and thus forming distinct loops prominently noticeable on the undersurface ; lamina coriaceous, glabrous on both surfaces, 10–12 cm. long, 3–4 cm. wide, petiole 7–8 mm. long. *Inflorescence* axillary racemes developing at the same time as the leaves, about 5 cm. long, peduncle slender terete, base not flattened ; bract subulate persistent on the axis and somewhat spinescent, at least so when dry. *Flowers* 4–5 mm. in diam. subsessile, regular, bisexual, light yellow, about 14–16 in each raceme ; each flower with two small broadly deltoid, acute bracteoles at the base. *Sepals* 4, free, biseriate (2 + 2), two lower roundish, 3 mm. in diam., two upper elliptic about 4 mm. long, all entire, glabrous and faintly veined. *Petals* 4 free in one whorl, broadly obovate, glabrous, acuminate near the base, distinctly and finely veined, 5 mm. long, 4 mm. wide. *Stamens* 8 free, subequal, 3–4 mm. long, anthers dithecal, versatile, somewhat reniform with distinct connective between the lobes, opening by a linear longitudinal slit ; walls of lobes deflexed outwards. *Carpels* 4 united, 4 mm. long, ovary trigonous, broader near the base, glabrous,

indistinctly 4-angled, style short, glabrous, stigma capitate, peltate ; *Fruit* not seen.

Burma. Upper Burma ; Kampti, N'mai Uka, alt. 1130 m., February 1912, *S. M. Toppin* 6273 (type in Herb. Calcutta).

This plant closely resembles *Stachyurus himalaicus* Hook. f. & Thoms., which has a wide range of distribution from Nepal to S.W. China. It differs in having more elongated leaves and the serration of the margin deflexed outwards. Besides, the venation is strikingly different from *S. himalaicus*. The primary veins converge much below the margin and join on to the next pair of veins forming distinct loops, whereas in *S. himalaicus* the veins directly run into the margin. Other points of difference of this species are the broader petals and glabrous ovary in contrast to narrower petals and villous ovary of *S. himalaicus*.

I consider the genus *Stachyurus* Sieb. et Zucc. as very distinct from the other genera of *Ternstroemiaceae* (*Theaceae*), and agree with Gilg (Pflanzenfam. ed. 2, **21,** 457) in placing the genus in a distinct family, *Stachyuraceae*.

Syzygium mishmiensis *Chatterjee* sp. nov. (*Myrtaceae*) ; *S. balsameo* Wall. pro maxima parte similis sed foliis angustioribus, nervis primariis fere duplo numerosioribus, omnibus infra marginem anastomosantibus, margine ipso deflexo, rhachi inflorescentiae breviore, floribus majoribus differt.

Shrub about 4 m. ; bark dark grey and corky, thin and pale inside, stem terete, smooth ; younger parts greyish white. *Leaves* opposite, shortly petioled, narrowly elliptic lanceolate, base cuneate, apex acute, margin entire, reflexed, subcoriaceous, both surfaces glabrous ; midrib shallowly channelled above, prominently raised below ; primary nerves 16–22 pairs, all anastomosing little below the margin in a continuous and prominent line, lamina 11–15 cm. long, 4–5 cm. wide, petiole 8–10 mm. long. *Inflorescence* axillary, racemose, 2–3 cm. long, rachis somewhat quadrangular, glabrous. *Flowers* subsessile, subglobose, small, about 4 mm. in diam. *Sepals* 4 subequal, broadly semiorbicular, lobes 2 mm. wide, introrse, coriaceous. *Petals* 4 almost free, semilunar, imbricating and bent inwards, 2·5 mm. in diam. *Stamens* many, introrse, filament 3 mm. long, anthers broadly elliptic, basifixed, lobes subequal. *Carpels* 2 united, style filiform, straight, stigma simple, capitate. Style and stigma 1 mm. long. *Fruit* not seen.

Assam. N.E. Assam ; Mishmi Hills, *Griffith* (collected before 1861) K.D. no. 2409 (type). Opposite Nizamghat, 6th December 1913, *U.N. Kanjilal* 3146.

This plant was first collected by Griffith about the year 1860, and it is interesting to find that after a lapse of fifty-three years the second collection was made from the same area by the late U. N. Kanjilal. The plant was partly confused with *Syzygium balsameum* Wall. var. *angustifolia* Duthie in Herb. Kew. Gamble pointed this out on the Kew sheets. The leaves are however very different and the venation so characteristic that it easily stands out as a distinct plant. It resembles *S. balsameum* Wall. in general features but differs in having narrower leaves with about double

the number of primary veins, somewhat larger flowers and shorter inflorescence rachis.

Symplocos subintegra *Chatterjee* sp. nov. (*Symplocaceae*) ; *S. ferrugineae* Roxb. pro maxima parte similis, foliis minus coriaceis fere glabris, floribus distincte pedicellatis, calyce glabro differt.

A large tree about 27 m. with profuse white flowers ; branchlets terete, dark brown, glabrous with many fine longitudinal furrows. *Leaves* alternate, petioled, broadly lanceolate, cuneate, apex subacuminate, margin nearly entire except for fine crenulations, tip of teeth obtuse and darker in colour, lamina subcoriaceous, glabrous, except midrib and veins on the undersurface which are rufous tomentose ; primary veins about 10 pairs running into the margins and not at all anastomosing. Midrib and primary veins much darker in colour, shallowly channelled above ; lamina 12–16 cm. long, 4–5 cm. wide ; petiole 10–15 mm. long, very thinly hairy. *Inflorescence* axillary racemes, 8–9 cm. long, rachis brown tomentose with about 20–24 flowers on each more crowded towards the apex. *Flowers* regular, bisexual, pedicelled, about 8 mm. in diam., pedicel 2–3 mm. long, dark brown, tomentose ; bracteoles 2, hyaline, conical, acute with fimbriate and ciliate margin 1·5 mm. long. *Calyx* of 5 united sepals, tube broadly funnel-shaped, lobes 5, petaloid, deltoid, imbricating, tube about 1 mm. long, lobes glabrous. *Corolla* of 5 nearly free white petals, imbricate, lobes alternating with calyx lobes, elliptic, glabrous, entire, 3–5 veined, 4 mm. long. *Stamens* many (about 70) in five bundles more or less united to the corolla base, filaments slender, glabrous, 4–5 mm. long, anther globose, lobes opening longitudinally. *Disc* pentangular, flat, densely hairy on top with grey hairs. *Ovary* conical, nearly hidden by the disc ; shorter than the stamens, style glabrescent, stigma capitate, entire, rugulose.

Burma. Myitkyina Dist. ; Tagwin evergreen forest ; 15th November 1925, *C. E. Parkinson* 323 (type).

This is a large tree and may yield useful timber. It resembles *Symplocos ferruginea* Roxb. in general features but differs in having thinner, almost glabrous leaves, distinctly pedicelled flowers and glabrous calyx.

Ceropegia barnesii *E. A. Bruce et Chatterjee* sp. nov. (*Asclepiadaceae*). Affinis *C. intermediae* Wight, sed foliis majoribus elongato-ovato-lanceolatis basi cordatis, lobis corollae late triangulari-ovatis valde distincta.

Twining plant with a terete, glabrous stem. *Leaves* opposite, thin, entire, petiolate ; petiole 2–3 cm. long, slender, glabrous ; lamina elongate-ovate-lanceolate, 18–24 cm. long, 4–6 cm. broad just above the cordate base, gradually narrowed to the acuminate apex, glabrous below, very sparsely hairy above, more densely so near the margins ; lateral nerves 7–10 on each side of the midrib, ascending. *Inflorescence* an axillary umbellate cyme of 3–5 flowers ; peduncle slender, about 2·5 cm. long, thinly pubescent ; pedicels similar, but shorter ; bracteoles minute, subulate, hairy. *Calyx* deeply 5-lobed ; lobes glabrous, subulate, 6–7mm. long, acuminate. *Corolla* about 4 cm. long, glabrous throughout ; tube 3 cm. long, spotted within in the lower part, globose-inflated at the base to about 1·3 cm. in diameter, then constricted into a short, gently curved, cylindric tube about 5 mm. in diameter at its narrowest point, afterwards

again dilated into a broad funnel-shaped mouth, about 2 cm. in diameter ; lobes broadly triangular-ovate, about 1·4 cm. long and almost as broad at the base, subacute at the apex, together forming a subglobose structure about 2 cm. in diameter. *Corona* double, inner and outer series united into one body ; inner lobes erect, club-shaped, smooth, glabrous, 2–3 mm. long, pale brownish-yellow throughout in the dried state except for a dark marking about 0·5 mm. deep at the base of each lobe ; outer corona of 5 minute pouches alternating with the inner lobes and very sparsely pilose. *Follicles* about 20 cm. long, 5 mm. in diameter, slender, linear-terete, divergent, glabrous. *Seeds* numerous, light brown in the dried state with a thick inflexed margin, oblong, about 1 cm. long with a silky coma 4–5cm. long.

South India. Without precise locality, *Barnes* s.n. (type).

C. barnesii can be readily distinguished from the other Indian *Ceropegias* by its characteristic leaves, which are much larger than those of other species. It is very similar to *C. intermedia* Wight in its coronal structure but differs in having larger flowers with broader corolla-lobes.

Chirita adenocalyx *Chatterjee* sp. nov. (*Gesneriaceae*). *C. urticifoliae* Buch.-Ham. aspectu similis sed petiolis pedunculisque longioribus, sepalis brevioribus conicis intus glandulosis differt.

Herb. Soft stem minutely tomentose with yellowish-brown hairs, uneven with fine longitudinal lines. *Leaves* opposite, petioled, ovate, acute, base oblique and narrowed, margin serrate, midrib and veins rather obscure on both surfaces, lamina papery, softly hairy on both surfaces, primary veins 7–9 pairs diverging from the midrib to the margins, 12–16 cm. long, 6–9 cm. wide, petiole 2–6 cm. long. *Flowers* showy, lemon yellow, usually in terminal cymes of 3 flowers, peduncle 5 cm. long, tomentose with golden brown hairs, bracts 2, sessile, ovate or ovate-lanceolate, acute serrate, about 20 mm. long, pedicel 20–22 mm. long, flowers bilabiate, open flower 5 cm. long, mouth about 2·5 cm. in diam. *Calyx* of 5 free, equal sepals, elongate conical, entire, apex subacute, thinly hairy outside and glandular within with minute white glands ; sepals 3-veined, 16 mm. long, 3 mm. wide. *Corolla* distinctly 2-lipped, dorsal lip larger and curved, throat conical 4 cm. long, margin of lobes subentire, throat and lobes veined, widest part 2 cm. in diam., base 5 mm. in width, upper free lobe 12 mm. long, rounded. *Stamens* 2, included, epipetalous, filament short, anthers large reniform ; filaments curved downward bringing two anthers close to the style and stigma, anthers 7 mm. wide, 4 mm. long. *Carpels* included, tubular, 4·2 cm. long, style not distinguishable from ovary except by lighter colour and very thin hairs, ovary glabrescent ; stigma short, bifid, with acute apices ; disk present, at the base of ovary, annular. *Young fruit* capsular, linear, 5·5 cm. long, 2 mm. wide.

Burma. Upper Burma, Kampti, Nama Uka, Marao Uka, 770 m., December 1911, *S. M. Toppin* 4251 (type).

This plant resembles *Chirita urticifolia* Buch.-Ham. in general appearance but differs in having longer petiole and peduncle and shorter, subcoriaceous, subacute, conical sepals which are distinctly glandular within.

Isotrema transsectum *Chatterjee* sp. nov. (*Aristolochiaceae*). Haec a caeteris speciebus clare differt ; ad *I. chrysops* Stapf accedit, sed ab eo differt foliis majoribus atque sinu angustiore ornatis, venis foliorum subtus clarius reticulatis atque distinctis, floribus limbo late cylindrico praeditis atque lobis irregularibus fere truncatis.

Woody *climber*. Young shoot covered with dense rusty tomentose hairs ; older parts glabrescent. Stem terete, twining, slender, finely ribbed and hairy. *Leaves* simple, alternate, petioled, elongate-ovate with rounded deeply cordate base, apex acute, margin more or less entire and slightly reflexed, especially in mature leaves; primary nerves 5–6 pairs, lowest pair further divided palmately into the cordate lobes ; veins running into the margins ; secondary veins conspicuously and freely reticulate below, coriaceous, glabrous above and hairy beneath ; lamina 12–19 cm. long, 3·5–6 cm. wide, basal sinus usually shallow (rather variable). Petiole slender, ribbed, 4–5 cm. long, thinly and minutely hairy. Flowers axillary on long pendulous stalk, usually solitary, dull to dark purple or chocolate, pedicels 4–5 cm. with a small subulate bract near the base ; bract and pedicel hairy with dark brown tomentum. *Perianth* about 5·5 cm. long, tube sharply recurved and constricted just above the middle and the limb more or less uniform and bell shaped ; perianth dark chocolate, thinly hairy outside, glabrous and partly glandular within ; mouth of the limb indistinctly bilobed ; posterior lobe very small, broadly ovate, anterior lobe much larger and truncate, limb only (above the constriction) 3 cm. long, 15 mm. in diam. distantly and reticulately veined with 5 principal veins, margins of lobes finely ciliate. *Stamens* usually 6 (sometimes 7), anthers adnate in pairs to the short stout stylar column, filaments absent. *Receptacle* narrowly club-shaped, villous with brown hairs, about 12 mm. long. Ovary indistinctly 6-celled ; style short, columnar, stigma fleshy, roughly deltoid, rugulose. *Fruit* not seen.

Assam. Naga Hills ; Paona, alt. 2500 m., *N. L. Bor* 2758 ; Delei Valley, alt. 2500 m., *Kingdon Ward* 8191.

Burma. North Burma ; Singku Wang, Base camp, alt. 2500 m., *Kingdon Ward* 6780 ; Mytkyina, near Zuklang, alt. about 2300 m., *C. W. D. Kermode* 17151 (type).

W. China. N.W. Yunnan ; in Salween Valley, *G. Forrest* 21074.

This is a distinct plant. It resembles *Isotrema chrysops* Stapf in general features, but differs in having larger leaves with more cordate leaf base, venation on the under-surface more distinct and reticulate, and in having flowers with a larger, broadly cylindrical limb, and irregular almost truncate lobes.

Stapf has discussed, in Bot. Mag. 8957, whether the genus *Aristolochia* should include Rafinesque's genus *Isotrema* or not, and a good summary of the claims of the respective genera has been recorded by Van Tieghem, in Journ. de Bot. **14,** 68 (1900). In my opinion the genus *Isotrema* represents a group of species quite distinct from *Aristolochia*. This is evident from the consideration of the floral characters, the grouping of stamens in pairs, and the fruit, which is ribbed, and apparently

indehiscent. On the whole the fruit looks very different. I agree with Stapf in keeping the genus distinct although Schmidt in Pflanzenfamilien ed. 2, **16B,** 235 (1935), has not done so.

Helicia obscurinervis *Chatterjee* sp. nov. (*Proteaceae*). Planta distinctissima. *H. terminali* Kurz similis, sed foliis latis obovatis, petiolis longioribus, nervis sub-indistinctis, lamina pedunculo longiore et floribus longioribus satis recedit.

Tree (?) ; branches terete, glabrous, dark brown at least when dry. *Leaves* shortly petioled, broadly obovate, margin entire (except for a trace of distant denticulation in occasional leaves), base cuneate, apex acute, lamina 15–24 cm. long, 4·8 cm. wide, subcoriaceous, midrib prominent beneath, not channelled above, primary nerves 6–10 pairs, rather inconspicuous, both surfaces glabrous, petiole 1–1·5 cm. long. *Inflorescence* axillary or terminal, racemose, 12–14 cm. long. Flowers usually arising from the inflorescence axis in pairs, tubular, bisexual, 28 mm. long including pedicel of 3–4 mm. in length, bracts minute. *Perianth* consists of four long free petals forming an apparently long tube in the bud stage but subsequently the petals open out and are recurved in mature flowers. The ends of these petals are thicker and hooded. *Stamens* four, opposite the petals, with long filaments. Anther bilobed, connective distinct and produced beyond the anther lobes into a triangular or deltoid end, anthers 2 mm. long, dehiscing longitudinally, lower half of stamens united with the petals, upper half remaining free. *Carpel* one, style slender, filiform with a club-shaped glabrous stigma. *Style* with stigma 25 mm. long, ovary small, glabrous, ovule 1. *Fruit* not seen.

Burma. Tavoy ; headwaters of Heinize Chaung near Camp 8, alt. 300 m., 8th February, 1919, *A. T. Gage* 77 (type in Herb. Calcutta).

Agricultural Chemistry*.—This book has been prepared to cover the normal syllabus in agricultural chemistry for degrees and diplomas in agriculture. It consists of three parts dealing respectively with soil, fertilisers, and animal nutrition. It is somewhat surprising to find no account, apart from scraps of information relevant to other subjects, of the chemical composition of plants, plant parts, and plant products. The account of the soil is a useful summary of modern discoveries and their practical applications. It is divided into two sections, one dealing with soil material and the other with soils. The four chapters on fertilizers include one introducing the subject and three which describe the chief organic manures, inorganic fertilizers, and liming materials. The last part of the book deals with animal nutrition and includes accounts of foods and their digestion, general animal metabolism, and the importance of minerals and vitamins. The last chapter deals with the chemical constituents of cows' milk.

W. B. Turrill.

* An Introduction to Agricultural Chemistry. By Norman M. Comber, H. Trefor Jones, and J. S. Willcox. London : Edward Arnold & Co., 1947, pp. 315. Price 8s. 6d.

THE DISTRIBUTION OF BRACHYPODIUM SERPENTINI C. E. HUBBARD.

F. Markgraf

Brachypodium serpentini C. E. Hubbard was described in Hook. Icon.Pl.33: t.3280 (1935) from Voskopoj west of Korçë in southern Albania. Hubbard explains that, according to decisive morphological characters, it shows certain surprising resemblances to species of *Festuca*, especially those of sect. *Variae* Hack. Therefore it is certainly an ancient species, perhaps a relict from the tertiary period, in relicts from which time Albania is so rich, especially in its serpentine area. To this area is limited also the famous *Forsythia europaea* Deg. et Bald. (cf.Markgraf in Mitt. D. Dendrolog.Ges.42 (1930, p. 1). *Brachypodium serpentini* is not unimportant as a characteristic plant of the Albanian serpentine soils : it holds the debris, forming tufts of stiff, convolute leaves, the yellowish colour of which contrasts with the blackish-green rock pieces. These tufts grow to 1 ft. in breadth and height. Their hard, pale sheaths are buried in the debris and well anchored by long, wiry roots. Above the leaves rises the short culm with its open yellow spike, which superficially resembles that of *Brachypodium pinnatum* (L.) Beauv. The spike contains only few fruits, not all flowers ripening their ovaries. I observed this state, ascribed by Hubbard to the long dry summer of 1935, also near Voskopoj, in 1941. All these fruits, however, germinated readily at Dahlem and gave rise to very slender-leaved seedlings which afterwards produced the characteristic strong tufts and began to flower in the second year. The plants raised from seed collected by Mr. Alston and Mr. Sandwith are thriving well in England. *Brachypodium serpentini* grows in scattered tufts in the open serpentine gravel slopes, mostly above 4,000 ft. and up to 6,600 ft. It is lacking in many places where serpentine gravel is present in Albania, but nevertheless it is distributed over almost the whole Albanian serpentine area, except only the northernmost parts. Already a long time before Alston and Sandwith discovered it in localities in the Voskopoj region, I had found it in other parts of Albania, but unfortunately I had determined it wrongly as *Brachypodium ramosum* Roem. et Schult., which is a coastal plant and is excluded already by this habitat. Therefore, it is known now from the following localities :

1. Matja : Skanderbeg Mountains, 2,300 ft. (Markgraf n. 1145) a. 1928.
2. Golloborda : Maja Shebenikut 6,600 ft. (Markgraf n. 740) a. 1924.
3. Elbasan : Mal i Shpatit, near Zavalin, 4,000 ft. (Markgraf n. 473) a. 1924.
4. Gur i Topit ; west of Qaf e Shalesit, 5,300 ft. (Markgraf n. 1541) a. 1928.
5. Korçë: Osoja N.W. of Voskopoj, 4,000 ft. (Stubbe. vgl. Markgraf 1942) a. 1941.
6. Korçë : Gjergjevica west of Voskopoj, 3,000 ft. (Alston & Sandwith (n. 2584) a. 1935.
7. Korçë : Voskopoj, 4,000 ft. (Alston & Sandwith n. 2016, type. n. 2708) a. 1933, 1935.
8. Korçë : Boboshtica south of Korçë, 3,000 ft. (Alston & Sandwith n. 2704) a. 1935.

This area reaches more or less the limits of the serpentine in the west, south and east, but not in the north, and I do not remember to have seen this species in the serpentine regions of northern Albania, north of the Matja. It would appear, therefore, that it found its northern limit at the southern shore of the sea beach, which in tertiary times covered the lower parts of the Matja, and that it did not expand its area until to-day.

This area would form a counterpart to that of *Forsythia europaea*, which includes the lower parts of the Matja from the northern serpentine region.

Localities published in : Fedde,Repert.Beih.45 (1927), p. 169 ; Denkschr. Akad. Wiss. Wien, Math.–Nat. Kl., 102 (1932), p. 317 : Hook. Icon. Pl. 33 (1935), t.3280 ; Journ. Bot. (1940), p. 243 ; Notizbl. Bot. Gart. Berl. 15 (1942), p. 664.

A NEW SPECIES OF CAREX FROM BURMA.

E. Nelmes.

Carex tavoyensis Nelmes, sp. nov. ; affinis *C. euprepi* Nelmes, sed squamis femineis longioribus oblongo-ovatis aristatis apice obtusissimis, utriculis tenuiter nervosis basi excepta hispidulis differt.

Rhizoma, *culmi* (rhachibus exceptis) et *folia* ignota, sed folia probabiliter bracteis (cf. infra) similia. *Rhachis* flexuosa, dura, rigida, angulis prominentibus obtusis vel subacutis, faciebus concavis, interdum leviter torta, basi 2 mm. crassa, sursum tenuior, internodiis superioribus minute subadpresso-hispidulis, inferioribus glabris et laevibus, multinervosa. *Bracteae* foliaceae, lineari-ellipticae, omnes suprema excepta subaequales, 2·3–3 cm. latae, 25–38 cm. longae (suprema 8–15 mm. lata et 17–20 cm. longa, interdum multo minore), omnes inflorescentiam multo superantes, planae, haud septato-nodulosae, supra tenuiter infra valde multinervosae, nervo medio nervisque 2 lateralibus validioribus, supra laeves (nisi apicem versus praesertim scabrae), infra nervis omnibus minute adpresso-hispidulae, subtenues, basi subpetiolatae, apicem versus acuminatae, apice acutae vel subacutae, vaginantes ; vaginae ampliatae sed durae, ligula collo brunneo membranaceo eroso-marginato instructa, dorso et ventre inferne glabrae, superne plerumque minute furfuraceo-hispidulae, inferiores 0·5–1·7 cm. longae, superiores breviores. *Inflorescentia* composite paniculata, interrupta, anguste oblonga, 12–25 cm. longa ; *paniculae secundariae* 3–5, inferiores distantes, superiores subapproximatae, plerumque erectae, singulae, oblongo-pyramidales, densiusculae, 2–4·5 cm. longae, 1·5–2·5 cm. crassae, ramis inferioribus 2–7-stachyis, ramis superioribus simpliciter spiciformibus, paniculae inferiores breviter superiores breviter vel brevissime pedunculatae ; pedunculi triquetri, laeves vel scabriusculi, firmi et subtenues. *Rhachis* panicularum secundariarum triquetra, angulis hispidulis acutis, faciebus saepe hispidulis. *Spicae* androgynaeceae, 5–9 mm. longae, sessiles, patulae vel patentes, parte feminea pauciflora circiter 2 mm. crassa (fructu immaturo), parte mascula densiflora, circiter 1 mm. crassa. *Bracteolae* squamiformes sed squamis multo minores, aristatae ; arista flexuosa vel curvata, 3 mm. vel ultra longa, hispidulo-marginata.

Cladoprophyllum inferne utriculiforme, superne squamiforme, dorso parce hispidulum, bilobum, 1·25–1·75 mm. longum. *Squamae femineae* 2·5–4 mm. longae, circiter 1 mm. latae, oblongo-ovatae, planiusculae vel cymbiformes, apice rotundo-obtusae, translucentes, pallide castaneae, marginibus late pallidae, tenuissime nervosae, apice ciliolatae, aristatae ; arista marginibus minute hispidula, 0·5–2 mm. longa, stricta vel curvata. *Utriculi* (immaturi) 4·5 mm. longi (rostro longo incluso), circiter 1 mm. lati, ellipsoidei vel obovoideo-ellipsoidei sed superne et (praecipue) inferne attenuati, obtuse trigoni, demum patuli (vel maturi fortasse subpatentes), tenuiter multinerves, subcoriacei, inferne ferruginei, superne pallidiores, basi glabra excepta pallide subadpresso-hispiduli, haud vel vix stipitati, in rostrum latum planum ventre tenuissime striatum dorso convexum et distincte nervosum distincte marginatum glabrum sed marginibus dense hispidulum pallidum vix sursum angustiorem strictum vel substrictum ore ventraliter oblique sectum bidentulum (dentibus lobuliformibus brevissimis marginibus hyalinis) 1·5–2 mm. longum subabrupte contracti. *Nux* (immatura) circiter 2·3 mm. longa, vix 1 mm. lata, trigona, ellipsoidea, pallide brunnea, estipitata, in rostrum brevissimum cylindricum truncatum desinens. *Styli* basis leviter incrassata, in apice nucis subpersistens. *Stigmata* 3.

Burma. Tavoy : Heinze Chaung, No. 1 Camp, 520 m., 3 April 1921, *P. T. Russell* (Botanical Survey of India Field No. 1935; type in Herb. Kew.).

E. Nelmes.

Chonemorpha macrophylla and C. grandeareana.

In my paper The Genus Chonemorpha (Kew Bull. 1947, no. 1), I stated (p. 50) that the name *Echites fragrans* Moon, Cat. Indig. Exot. Pl. Ceyl. 20 (1824) was a *nomen nudum* and therefore could not be considered for purpose of priority or as the basis of a new combination. I now find that Moon's name was accompanied by a reference to *Belutta-Kaka-Kodi* of Rheede, Hort. Malab. **9**, t. 5 and 6 (1689). This reference to a " previously and validly published (pre-Linnaean) description " is of course sufficient to validate the name *Echites fragrans* Moon. (In this connection Robinson's very interesting paper (Philip. Journ. Sc. Bot. **7**, 411 : 1912) may be consulted, where many names from Roxburgh's *Hortus Bengalensis* were validated on this principle.) The correct name for *Chonemorpha macrophylla* (Roxb.) G. Don, 1837 (*Echites macrophylla* Roxb., 1832, non H. B. K., 1819) is therefore **Chonemorpha fragrans** (*Moon*) *Alston.**

In the same paper (p. 49) for **Chonemorpha grandeareana** read **Chonemorpha grandiereana** *Pierre ex Spire*.

D. Chatterjee.

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* Furtado has expressed the opinion (Gard. Bull. Str. Settl. **10**, 170-71, 1939) that such a method of supplying a binominal and referring to description or plate in effectively published pre-1753 literature should be considered as invalid publication. I am unable to accept his view.

DIDELTA AND CUSPIDIA

B. L. Burtt.

Some years ago specimens of an annual yellow-flowered member of the *Compositae* were received in a collection of plants from Mr. F. R. Long, Port Elizabeth, South Africa. It had prickly leaves and involucral bracts and was remarkable for the fact that at the base of each plant persisted an old indurated capitulum, the seed having evidently germinated without dispersal from the flower-head. This phenomenon is well known in *Gorteria*, but the general facies of this plant did not agree with that genus, and it proved unexpectedly difficult to identify, as it failed to fit into any of the generic keys. Eventually it was matched with *Berkheya cernua* (L. f.) R. Br., a species whose position in *Berkheya* is decidedly unhappy on account of its setose, not paleaceous, pappus. In *Flora Capensis* Harvey referred this species to *Didelta*, from which it is likewise excluded by the key-character " Pappus of many flat separate scales." The position clearly called for investigation, and has led to a revision of the genus *Didelta* as circumscribed by Harvey.

Harvey, following Lessing and De Candolle, included five species in the genus, namely *D. carnosa* (L.f.) Ait., *D. spinosa* (L.f.) Ait., *D. annua* Less., *D. cernua* (L.f.) Less. and *D. tomentosa* Less. Of these the last named is now included in *D. carnosa*, whilst *D. annua* is reduced to *D. cernua*, so that we are here concerned chiefly with the remaining three species. The history of these plants is somewhat involved and it is necessary to give some account of it before dealing with the taxonomy.

History of D. carnosa and D. spinosa

These two species were originally described by the younger Linnaeus in 1781 as *Polymnia carnosa* and *P. spinosa*, and we may say at once that *Polymnia* is an American genus of *Helianthoideae* to which these S. African plants bear little resemblance save in their very broad outer phyllaries.

In 1785 Buc'hoz published in his *Grand Jardin de l'Univers* a coloured illustration, with dissections, of a plant in cultivation at Trianon, evidently the *Polymnia carnosa* L.f. Buc'hoz called it *Breteuillia trianensis*, and his plate, as it includes dissections, is sufficient to validate both generic and specific names.

The genus *Didelta*, which, as will be seen later on, was based on the same plant, was published in the third fascicle of L'Héritier's *Stirpes Novae*, the title page of which is dated 1785. Britten and Woodward (Journ. of Bot. **43**, 268 : 1905), however, have concluded that it was not actually published until April 1786. *Breteuillia* Buc'hoz thus antedates *Didelta* L'Hérit., but the latter name has been used so widely and for so long that I have proposed it for conservation (Burtt in Kew Bull. 1939, 327).

L'Héritier's single species, *D. tetragoniifolia*, is again the *Polymnia carnosa* L.f., the identity being first pointed out in William Aiton's *Hortus Kewensis*, where *Polymnia spinosa* is also transferred to the same genus. These two plants were again made into a new genus, *Choristea*, by

Thunberg, while, as a final note on the botanical history of *Polymnia carnosa*, it may be mentioned that it was redescribed as a new genus and species in 1896 by F. W. Klatt, who called it *Distegia acida* ; an error which was promptly spotted by the late Dr. N. E. Brown.

Turning to the independent history of *Polymnia spinosa* L.f., we find that Gaertner established a new genus, *Favonium*, for it in 1791. Unfortunately the description of this genus makes no reference to *Didelta*, published by L'Héritier 6 years earlier, and we cannot therefore say whether Gaertner thought them distinct or was simply unaware of L'Héritier's work. Jussieu and Cassini kept *Favonium* distinct from *Didelta*, though both confessed to some doubt on this point ; all other workers have united the two genera and this course is now followed. It is considered that the differences between these two plants (see key) are outweighed by their striking similarities, especially in the general facies of the capitulum and the fragmentation of the mature receptacle.

It is appropriate here to pay tribute to L'Héritier's original description of *Didelta*, which runs : " Calyx [i.e. involucrum] duplex. Corolla flosculis disci sterilibus lateralibus perfectis ; radii ligulatis neutris. Germina immersa. Receptaculum separabile, partim setosum, partim nudum. Segmenta receptaculi indurescentia in Pericarpia. Pappus simplex." 160 years ago L'Héritier wrote with a concise clarity too often lacking in later works.

Harvey thought that the word *Didelta* referred to the shape of the phyllaries, but L'Héritier had himself given the true derivation of the name "A voce graecâ δις bis, et majusculâ graecâ △ delta, quod receptaculum deltas s. triangula duplicis structurae refert." The latin word *delta* may be either feminine or neuter (and indeclinable) : L'Héritier used the feminine form and made the genus feminine ; there is thus no justification for the action of most later authors in changing it to neuter.

History of D. cernua

This species was described as *Gorteria cernua* L.f. in 1781. At about the same time it was named *Gorteria araneosa* by Nicholaas Meerburgh in his *Afbeeldingen van zeldzaame Gewassen*. This troublesome book has already been the subject of certain observations in an article by the present writer on *Impatiens capensis* (Burtt in Kew Bull. 1938, 161). To recapitulate briefly, the date on the title-page, which is 1775, only refers to the first 10 plates and their accompanying text. The remainder was published in parts, again consisting of 10 plates with 2 sheets of text to each, sometime between 1775 and September 1782, the latter date being fixed from the diary of Friedrich Ehrhart (Beiträge zur Naturkunde, **2,** 115–116 : 1788). *Gorteria araneosa* Meerb. was published in the fourth part and it is at present impossible to fix the date exactly.

In 1791 Gaertner established for this same plant a new genus which he called *Cuspidia*. The single species he named *C. araneosa* ; that is to say he used the epithet which had been already proposed by Meerburgh although Gaertner himself makes no reference whatsoever to Meerburgh's work. It is hard to believe that Gaertner had not seen Meerburgh's

book, and that he chose the same epithet by mere chance, even though it happens that *araneosa* is exceedingly appropriate. However, the rules of nomenclature are not concerned with probability, and *Cuspidia araneosa* Gaertn. must rank as an independently proposed name ; it is therefore illegitimate because Gaertner quoted the earlier *Gorteria cernua* L.f. as a synonym. We thus have the position that under the generic name *Cuspidia* (we shall give reasons below for reviving this) *araneosa* is no longer available as an epithet, and the correct name for this plant, irrespective of whether *Gorteria cernua* L.f. or *G. araneosa* Meerb. was the first to be published, becomes *Cuspidia cernua* (L.f.) B.L. Burtt.

To complete the history of this plant, the genus *Cuspidia* was accepted by Jussieu and Cassini, but Lessing regarded it as a subgenus of *Didelta*, and De Candolle and Harvey as only a section of that genus. R. Brown, Bentham and O. Hoffman, however, have all included *Cuspidia* in *Berkheya* rather than in *Didelta*.

Cuspidia may be distinguished from *Didelta* by two salient characteristics : first, the pappus is setose in *Cuspidia*, paleaceous in *Didelta* ; secondly, the fruiting capitulum of *Cuspidia* remains intact, that of *Didelta* breaks up into triangular segments. Despite this latter difference it should be noted that *Cuspidia* and *Didelta* agree in that the ripe achenes are retained within the deep alveolae of the receptacle and are not individually distributed. The fragmenting receptacle of *Didelta* is not, to my knowledge, paralleled elsewhere in *Compositae* ; the condition in *Cuspidia*, however, is well known in the allied genus *Gorteria*, and also in the Australian *Erodiophyllum* F. Muell., belonging to the tribe *Asteroideae*. Biologically this condition recalls that found in the Brazil Nut (*Bertholletia* —see W. Watson in Ann. Bot. **15,** 99 : 1901) and in many other fruits which have several seeds enclosed in a stony endocarp (see A. W. Hill in Ann. Bot. **47,** 873 : 1933 ; and N.S. **1,** 239 : 1937), or in such indehiscent fruits as *Medicago*. In such cases a heavy seedling mortality is rendered inevitable through the absence of any mechanism to ensure the dispersal from one another of the several seeds of the fruit or infructescence. This inherent seedling mortality is a factor which must be reckoned with seed-production and seed-viability in evaluating the reproductive capacity of the species.

Synopsis

Didelta *L'Hérit.* Stirp. Nov. fasc. **3,** 55 (1786) ; Lam. Encycl. Méth. **2,** 278 (1786) ; Aiton, Hort. Kew. **3,** 256 (1789) ; Schreb. in Linn. Gen. Pl. ed. 8, 590 (1791) ; Lam. Tabl. Encycl. (Ill. Gen.), **4,** t.705 (1797); Wendland, Bot. Beob. 31 (1798) ; Willd. Sp. Pl. **3,** pt. 3, 2262 (1804); Poir. in Lam. Encycl. Mèth. bot. suppl. **2,** 480 (1811) ; R. Br. in Aiton, Hort. Kew. ed. 2, **5,** 139 (1813) ; Cass. in Dict. Sci. Nat. **13,** 221 (1819) & **29,** 451 (1823) ; Poir. in Lam. Tabl. Encycl. (Ill. Gen.) **3,** 282 (1823) ; Less. Syn. Comp. 59 (1832), excl. subgen. *Cuspidia* ; DC. Prodr. 6, 503 (1837), excl. sect. *Cuspidia* ; Harv. Gen. S. Afr. Pl. 197 (1838), ed. 2, 205 (1868), in Harv. & Sond. Fl. Cap. **3,** 510 (1865) excl. sect. *Cuspidia* ; Benth. in Benth. & Hook. fil. Gen. Pl. **2,** 461 (1873); O. Hoffm. in Engl. & Prantl, Nat. Pflanzenfam. **4,** Abth. 5, 311 (1892); Thonner, Fl. Pl. Afr. 551 (1915) ; E. P. Phillips, Gen. S. Afr. Fl. Pl. 679 (1926).

Breteuillia Buc'hoz, Grand Jard. Univ. t. 62 (1785).

Favonium Gaertn. De Fruct. et Sem. **2,** 431, t. 174, f. 1 (1791) ; Juss. in Ann. Mus. Hist. Nat. Paris, **7,** 389 (1806) ; Cass. in Dict. Sci. Nat. **16,** 295 (1821) & **21,** 448, 452 (1823).

Choristea Thunb. Prodr. Pl. Cap., nov. gen. lxi & p. 163 (1800), Fl. Cap. (ed. I. A. Schultes) 702 (1823).

Distegia Klatt in Bull. Herb. Boiss. **4,** 463 (1896).

Leaves fleshy, linear to obovate-elliptic, usually densely tomentose ; outer flowers of capitulum sterile ; centre of fruiting receptacle spiny. 1. *carnosa*

Leaves leathery more or less oval or elliptic, often amplexicaul at the base, spiny-toothed, glabrous ; outer flowers female, fruiting receptacle not spiny. 2. *spinosa*

1. **Didelta carnosa** (*L.f.*) *Aiton*, Hort. Kew. **3,** 256 (1789).

Polymnia carnosa L.f. Suppl. 384 (1781).

Breteuillia trianensis Buc'hoz, Grand Jard. Univ. t.62 (1785).

Didelta tetragoniifolia L'Hérit. Stirp. Nov. fasc. **3,** 55, t.28 (1786).

D. capensis Lam. Encycl. Méth. bot. **2,** 278 (1786).

Choristea carnosa (L.f.) Thunb. Prodr. Pl. Cap. 163 (1800).

Didelta obtusifolia Cass. in Dict. Sc. Nat. **20,** 451 (1823).

D. tomentosa Less. Syn. Comp. 60 (1832) ; Engl. Pflanzenw. Afr. **1,** Heft 2, 520, f. 443 (1910).

Distegia acida Klatt in Bull. Herb. Boiss. **4,** 463, t.4 (1896).

Western South Africa. Occurs near the sea from Cape Division northwards to Luderitz Bay in S.W. Africa and up to 60 miles inland in Little Namaqualand.

It is by no means improbable that two species should be distinguished here ; the name *D. tomentosa* Less. has, indeed, been not infrequently used. Certainly an extreme form, such as that collected by R. H. Compton at Kolmanskop, S.W. Africa, which has obovate elliptic leaves and is densely tomentose all over, can scarcely be included in the normal concept of *D. carnosa*. However, the numerous intermediate forms need field study before a satisfactory distinction can be drawn, and if this is eventually achieved the applicability of the name *D. obtusifolia* Cass. will have to be considered.

2. **Didelta spinosa** (*L.f.*) *Aiton*, Hort. Kew. **3,** 256 (1789) ; Wendland, Bot. Beob. 31 (1798).

Polymnia spinosa L.f. Suppl. 384 (1781).

Favonium spinosum (L.f.) Gaertn. De Fruct. et Sem. **2,** 431, t. 174, f. 1 (1791).

Choristea spinosa (L.f.) Thunb. Prodr. Pl. Cap. 163 (1800).

Western S. Africa. Clanwilliam Div. northwards to Namaqualand.

De Candolle (Prodr. **6,** 503 : 1837) recognized two varieties of this plant ; var. *thunbergii* DC. with deeply cordate and var. *dregei* DC. with

scarcely cordate leaf-bases. A third condition may be distinguished, for the leaf-bases may be connate across the stem. This occurs on Dinter 8196 and on the same specimen is a small lateral branch with leaves narrowed to the base. Other collections include separate branches belonging to var. *dregei* and var. *thunbergii* and it is therefore highly probable that these variations in the form of the leaf-base are of no taxonomic value.

Cuspidia *Gaertn.* De Fruct. et Sem. **2,** 454 (1791) ; Juss. in Ann. Mus. Hist. Nat. Paris, **7,** 179 (1806) ; Cass. in Dict. Sc. Nat. **12,** 251 (1818), & **21,** 448, 451 (1823).

Aspidalis Gaertn. l.c. t. 171, f.5 (1791).

Didelta subgen. *Cuspidia* (Gaertn.) Less. Syn. Comp. 61 (1832).

Didelta sect. *Cuspidia* (Gaertn.) DC. Prodr. **6,** 503 (1837) ; Harv. in Harv. & Sond. Fl. Cap. **3,** 511 (1865).

Cuspidia cernua (*L.f.*) *B. L. Burtt*, comb. nov. *Gorteria cernua* L.f. Suppl., 382 (1781) ; Wendland, Bot. Beobacht. 31, f. 30 (1798) ; Thunb. Mon. Art. Gorteria in Skrivt. Naturh. Selsk. **4,** pt. 2, 8 (1798), Prodr. Pl. Cap. 162 (1800), Fl. Cap. (ed. I. A. Schultes) 697 (1823).

Gorteria araneosa Meerburgh, Afbeeld. zeldz. Gewass. t. 40 (1775–82) ; Pl. Rar. t. 40 (1789).

Cuspidia araneosa Gaertn. De Fruct. et Sem. **2,** 454 (1791).

Aspidalis araneosa Gaertn. l.c. t. 171, f. 5 (1791).

Berkheya cernua (L.f.) R. Br. in Aiton, Hort. Kew. ed 2, **5,** 139 (1813).

Cuspidia castrata Cass. in Dict. Sc. Nat. **12,** 252 (1818).

Didelta cernua (L.f.) Less. Syn. Comp. 62 (1832) ; DC. Prodr. **6,** 503 (1837) ; Harv. in Harv. & Sond. Fl. Cap. **3,** 511 (1865).

Didelta annua Less. l.c. 61 (1832) ; DC. l.c. 503 (1837) ; Harv. l.c. 511 (1865).

Central and Eastern Cape Province. Fraserburg Div. to Port Elizabeth and Albany.

The Arboretums and Botanical Gardens of North America.*— This is a useful work of reference for anyone concerned with North American botanical institutions engaged in the cultivation of living plants. The Introduction has some valuable suggestions on the establishment of an arboretum, with special reference to the procedure of maintenance at the Arnold Arboretum. The main portion gives particulars concerning 90 arboretums and botanical gardens situated in the United States, Canada, and Cuba. The data given cover chief functions, main features, numbers of species and varieties grown, ownership, admission, directorship, library, publications, and references. In addition there is a list of small collections of special plants and a bibliography. The accompanying maps and illustrations are of considerable historical interest.

*By D. Wyman. Chronica Botanica, volume 10, number 5/6, pp. 395—498, 1947, $1. 50. The Chronica Botanica Co., Waltham, Mass. Obtainable through Wm. Dawson & Sons Ltd., London, W.C.2.

THE CORRECT NAMES OF THE AUSTRALIAN BLUEBELL CREEPERS.

B. L. Burtt.

Two species of these pretty climbers belonging to the genus *Sollya* Lindl. (*Pittosporaceae*) were recognized by Bentham in his Flora Australiensis : *S. heterophylla* Lindl. and *S. parviflora* Turcz. *S. heterophylla* had first become known when it was described by Labillardière in 1804 as a species of the allied genus *Billardiera*, under the name *B. fusiformis*. In 1832 Lindley proposed the genus *Sollya* comprising the two species *S. heterophylla* and *S. angustifolia*, with the latter of which he identified *Billardiera fusiformis*. *S. angustifolia* is therefore an illegitimate name. Furthermore Lindley's later use of *S. heterophylla* (Bot. Reg. 1840, sub t.3), is also illegitimate as he there included in it *S. angustifolia*, so that *fusiformis* became the earliest epithet for the composite species.

The name *Sollya fusiformis* was first used by Payer in 1857 in his work on floral morphology, and he made no reference to *Billardiera fusiformis*. It is quite unlikely that Payer would have described a new species in a work of this kind without any explanation of the fact, and, it may be argued, he was simply adopting the earliest epithet for *Sollya heterophylla*. It would, indeed, have been a strange coincidence if he had chosen the epithet *fusiformis* quite independently. Nevertheless, however probable such an explanation may be, it is, in the ultimate analysis, supposition. Nomenclature deals with facts, not suppositions, and the fact is that Payer made no reference whatsoever to *Billardiera fusiformis* Labill. : his name *Sollya fusiformis* cannot therefore be accepted as a combination based on Labillardière's species.

Payer's *Sollya fusiformis*, however, must stand as an independent valid name, for he gave a good description of the inflorescence and floral structure. Consequently any later combination in *Sollya* based on *Billardiera fusiformis* (as proposed by Briquet in 1919) is a later homonym and must be rejected. *S. heterophylla* Lindl., which was a legitimate name as originally applied, therefore stands as the correct name for the whole species.

The refusal to accept *Sollya fusiformis* Payer as a new combination based on *Billardiera fusiformis* is in strict accordance with the International Rules of Nomenclature. Rehder (Journ. Arn. Arb. **20,** 137 : 1939) has adopted the same attitude in rejecting *Pyrus aucuparia* Ehrh. (which was published without any indication of the name-bringing synonym), although the intention that it should be a new combination based on the well-known *Sorbus aucuparia* L. may be considered obvious.

The opposite view has been taken by Merrill (Brittonia, **5,** 25 : 1943) in dealing with new binary names used by Boldingh in his key to some Javanese plants (Zakfl. Landbou. Java : 1916). Here again no synonymy is quoted, but the author's intention to use the oldest specific epithet is fairly clear. Merrill has accordingly been at pains to identify the presumed name-bringing synonym in each case, and accepts Boldingh's names as new combinations based on these unquoted synonyms. Such a procedure may well lead to differences of opinion, as when Merrill is

constrained to propose *Gynura aurantiaca* DC. var. *puberula* DC. as the name-bringing synonym of *Gynura pubigera* Boldingh. In the case of Boldingh's work the fact that some 20 names are involved considerably strengthens the supposition that they were intended as combinations. It is inconceivable that he should have repeatedly re-used the oldest epithet independently. This weighty evidence is not available, however, where only a single name is involved. For instance, in 1791 Gaertner (De Fruct. et Sem. **2,** 454) described a new genus of *Compositae*, *Cuspidia*, with a single species *C. araneosa*. This plant had previously been described by Meerburgh (Afbeeld. Zeldz. Gewass. t.40 : 1775–82) as *Gorteria araneosa*, but Gaertner gives no reference to Meerburgh's work nor is there conclusive evidence that he knew of it. The epithet *araneosa* is most appropriate and could well have been chosen independently. I do not therefore accept *Cuspidia araneosa* as a new combination, but as a new name : it is illegitimate because Gaertner quoted *Polymnia cernua* Linn. fil. as a synonym.*

In general, therefore, it is considered that binary names can never be accepted as new combinations unless there is some indication of the name-bringing synonym, however probable it may seem that a new combination was intended.†

The second species of *Sollya* in Bentham's Flora Australiensis is *S. parviflora* Turcz. Under this, Bentham quoted *S. drummondii* C. Morren as a possible synonym. Further investigation shows that *S. drummondii* is conspecific with *S. parviflora* and has priority of publication. The date usually ascribed to *S. parviflora* Turcz.—1854—is wrong. The description appeared in Bull. Soc. Imp. Nat. Moscou, **27,** pt. 2, which is the last of 4 parts for the year 1854 and bears that date on the title page. On the reverse of the title page, however, is a statement authorising publication, and this is dated April 1855. It is clear, therefore, that publication did not take place before that date.

Sollya drummondii C. Morren was published in La Belgique Horticole for 1854. It was in the sixth of twelve presumably monthly parts, and therefore probably appeared in June 1854, antedating *C. parviflora* Turcz. by 10 months. *S. salicifolia* Marnock, also mentioned by Bentham as a probable synonym of *S. parviflora*, is not distinguishable from *S. heterophylla*.

The two species are therefore :—

Sollya heterophylla *Lindl.* Bot. Reg. t. 1466 (1832); Benth. Fl. Austr., **1** 126 (1863). *Billardiera fusiformis* Labill. Pl. Nov. Holl. **1,** 65, t. 90 (1804). *Sollya angustifolia* Lindl. l.c. *S. salicifolia* Marnock in Floricultural Mag. **4,** 62, 136 t. 44. f.2 (1839–40). *S. linearis* Lindl. Bot. Reg. t.3 (1840). *S. fusiformis* Payer, Organogr. Comp. Fl. 176, t.34 (1857). *S. heterophylla* var.

* The correct name for this plant is accordingly *Cuspidia cernua* (Linn. fil.) B. L. Burtt (see K.B. 1948, p. 73).

† Were such supposed intentions accepted there would be an equally strong case for recognising many combinations at one time attributed to " Benth. & Hook. f. Gen. Pl." but now rejected by all responsible botanists on the ground that, though the intention to transfer is clear, the combinations were not in fact made. For example, in Gen. Pl. **2,** 861 (1876) under *Sericostoma* Stocks we find " Huc pertinet etiam *Lithospermum Kotschyi* Boiss." The nomenclatural combination, however, must date from the first use of it; namely by Franchet in Revoil, Çomal. 147 (1882).

angustifolia (Lindl.) Benth. l.c. *S. fusiformis* (Labill.) Briq. in Ann. Conserv. & Jard. Bot. Genev. **20,** 423 (1919)—non Payer.

Sollya drummondii *C. Morren* in La Belg. Hort. **4,** 196, t. 33, f. 3–8 (1854). *S. parviflora* Turcz. in Bull. Soc. Nat. Imp. Moscou, 1854, **27,** pt. 2, 361 (1855) ; Benth. Fl. Austr. **1,** 126 (1853).

REVIEW.

The Indian Ecologist.*—The Indian Ecological Society and Dr. Bharucha in particular are to be congratulated on the first number of their new journal—The Indian Ecologist—which is well produced. There are seven original contributions of which one deals with anatomy and another with pure taxonomy. Other papers relate to ecological aspects of Indian plants and certain species of British *Trichoptera* (Caddis flies). There is no paper in this number dealing with ecological surveys, with the exception of one on a small area near Benares.

In a country like India, where the annual rainfall varies from 8 to 500 inches, and the elevation from sea level to the highest peak in the world, the diversity in climate and its consequent effect on plant associations is obviously unique. This is again further influenced by the peculiarities in temperature and edaphic conditions. Such a journal as this is therefore welcome and stimulating in a country where the scope and possibilities of ecological studies are immense. Unfortunately our knowledge of tropical ecology is still very meagre. This has been already pointed out (Nature **156**: 627) by Dr. Chapman and others. Their suggestions on practical improvements to counteract this condition are worth careful consideration. The Indian Ecological Society, formed in 1941, is apparently the only scientific body in India which is concentrating on the study of tropical ecology, and it is hoped that much valuable work will be done by this organisation and through its journal.

It must, however, be emphasized that the success of the journal will largely depend on the quality of original contributions. Although taxonomy and anatomy are closely related to ecology, it is highly desirable that the journal should concentrate on the publication of much-needed papers on ecological surveys of Indian districts. On the other hand, the inclusion of bio-geographical contributions on India's fauna and flora would be welcome.

D. Chatterjee.

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* The Indian Ecologist, Vol. I, no. 1. Edited by Dr. F. R. Bharucha for the Indian Ecological Society ; Royal Institute of Science, Bombay 1, India. Price : to non-members, Rupees fifteen per volume.

STUDIES IN THE ERICALES : V.*

FURTHER NOTES ON AGAPETES. H. K. AIRY SHAW.

Since the publication of my original paper on this genus (*Bull. Misc. Inf.*, Kew, **1935** (1), 24–53 : 1935) a certain amount of new material, including several new species, has come to hand, and it has also been found possible to prepare keys to those parts of the genus not at that time dealt with. This paper is therefore complementary to the original account ; taken in conjunction they should provide the means for identifying the bulk of the *Agapetes* material present in herbaria. There is every indication, however, that many fresh forms will come to light with the continued exploration of Burma, Assam and Bhutan.

An exhaustive and valuable account of the genus *Vaccinium* in Eastern Asia has been included by H. Sleumer in his paper " Vaccinioideen-Studien " in Engler, *Bot. Jahrb.* **71** (4), 375–510 (1941) ; see pages 427–493. In it he touches more than once on the vexed question of the separation of *Vaccinium* (Sects. *Epigynium* and *Euepigynium*) and *Agapetes*. I feel that the view which he puts forward on page 409 is a reasonable and practical one : " Geben wir . . . . zu, dass *Agapetes* und eine grosse Anzahl der ostasiatischen Vaccinien aus dem gleichen entwicklungsgeschichtlichen Fundus stammen, so können wir doch, für die Gattungsabgrenzen gewissermassen den D u r c h s c h n i t t der Merkmale ins Auge fassend, zwei Gattungen erkennen, so künstlich auch die Zuweisung einzelner Arten (wie *Agapetes acuminata* oder *Vaccinium piliferum*) zu einer der beiden Gattungen sein mag." I adopt this standpoint as a working basis, in order to avoid making the genus *Vaccinium* more unwieldy than it already is.

The species are dealt with under the three series, *Robustae*, *Graciles* and *Longifiles*, established in 1935, and a new one, *Pteryganthae*, embracing the former genus *Pentapterygium* Klotzsch and a remarkable new species discovered in Tibet in 1938 (see p. 97). Complete keys to the *Robustae* and *Pteryganthae* are provided, and a revised key to part of the *Longifiles*. In the case of the key to the *Robustae*, which is to some extent artificial, a running number has been prefixed to each species as a very approximate guide to affinity and the direction of evolution.

The opportunity is also now taken to publish some drawings prepared by my sister, Mrs. E. Milne-Redhead, for the 1935 paper. Circumstances unfortunately prevented their inclusion at the time. I am much indebted to Mrs. Milne-Redhead for these admirable figures.

All specimens cited are preserved in the Kew Herbarium, except where otherwise stated.

SERIES ROBUSTAE

KEY TO THE SPECIES

Leaves shallowly but distinctly (rarely obscurely) denticulate :

Leaves very large, not distinctly pseudo-verticillate, 20–30 cm. long and 7–13·5 cm. broad, with a massive petiole 2 cm. long and 6–7 mm. thick ; teeth shallow and distant, sometimes obscure ;

* Continued from *Bull. Misc. Inf.*, Kew, **1940** (7), 330 (1941).

inflorescences axillary, 7–8-flowered, the axis 2·5–8 cm. long, pedicels 3–4 cm. long ; calyx 12–14 mm. long, divided about half-way ; corolla about 2·5 cm. long with rather short ovate-deltoid segments . . . . . 1. *A. macrophylla* C. B. Clarke

Leaves (3) 6–24 cm. long and (1) 2–8 cm. broad, with much more slender (and usually shorter) petiole ; axis of inflorescence rarely reaching 1·5 cm. in length :

Axis of inflorescence 1·5–5 cm. long, puberulous ; leaves 8–17 cm. long, 3–5·5 cm. wide, rounded or subcordate at base, rather obscurely and obtusely denticulate ; corolla less than 1·8 cm. long, puberulous . . . . . 4. *A. glabra* (Griff.) C. B. Clarke

Axis of inflorescence rarely reaching 1·5 cm. in length :

Flowers very large : calyx-segments oblong-lanceolate, 1·5–1·8 cm. long, almost free or united for 5–6 mm. ; corolla 5–6 cm. long, 1·8 cm. wide when pressed, somewhat ventricose, segments 1 cm. long, erect-spreading ; leaves oblong-lanceolate to elliptic-lanceolate (or oblanceolate in var. *oblanceolata* Airy Shaw), 16–24 cm. long, 5–7 cm. wide, venation conspicuously reticulate, margin very shallowly denticulate (mostly towards apex), base rounded or subcordate, petiole 2–3 mm. long . . . 2. *A. burmanica* W. E. Evans †

Flowers smaller, calyx less than 1 cm., corolla less than 2·5 cm. long :

Leaves large and thin, 12–18 cm. long, 4·5–8·0 cm. wide, rather closely and conspicuously serrate, very conspicuously pseudo-verticillate, the false whorls sometimes separated by as much as 31 cm., with large scattered brown-membranous leaf-scales on the intervening portion of stem ; inflorescence-axis about 1 cm. long, pedicels 2–2·3 cm. long, conspicuously bracteate at the base ; calyx 8–9 mm. long, segments almost free ; corolla 2–2·2 cm. long, with short lobes . . . . . 6. *A. miniata* (Griff.) Hook. fil.

Leaves smaller, up to 16 cm. (rarely 20 cm.) long and 4 cm. (rarely 7 cm.) wide, less closely and conspicuously serrate :

Leaves strongly pseudo-verticillate, more or less discolorous:

Leaves obscurely undulate-denticulate, not bullate ; inflorescences racemose or corymbose ; corolla 2–3 cm. long, broadly cylindric, markedly or slightly oblique at the mouth . . . . 15. *A. setigera* D. Don ex G. Don

Leaves with small but distinct projecting teeth, distinctly bullate ; inflorescences subumbelliform, peduncle 1–1·5 cm. long, pedicels the same, conspicuously bracteate at base ; calyx-segments lanceolate, almost free, corolla short, conical, 7–9 mm. long, lobes very short, suberect . . . . . *Vaccinium* (Sect. *Epigynium*) *bulleyanum* (Diels) Sleumer*

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* Included in the key on account of its very " Agapetoid " appearance.
†See Notes, *infra*.

Leaves scattered or scarcely verticillate, strongly and gradually acuminate, concolorous, brownish-green when dry :

Leaves coriaceous, nervation prominent and reticulate on both surfaces, submarginal nerve distinct ; teeth shallow, sometimes obscure ; petiole short, 3–5 mm. long ; flowers fasciculate, or peduncle extremely short (1–2 mm.) ; calyx-segments 2–3 mm. long, almost free ; corolla narrowly pentagonal-cylindric, 2–2·3 cm. long ; lobes subulate, 5–6 cm. long, recurved . . 13. *A. odontocera* (Wight) Hook. fil. †

Leaves thinly chartaceous, nervation distinct and fine, but prominent only on the lower surface ; petiole about 1 cm. long, sometimes glaucous when dry ; calyx-teeth very shortly deltoid, 1·5 mm. long :

Branches more or less angled, sometimes conspicuously so (almost winged) ; inflorescence glabrous, the axis 5–8 mm. long, bracts and bracteoles short (1 mm.) but evident ; corolla narrowly pentagonal-cylindric (as in *A. odontocera*), 2–2·3 cm. long, with subulate lobes . . . . . 7. *A. angulata* (Griff.) Hook. fil. †

Branches very rugose and lenticellate, not or scarcely angled ; entire inflorescence ± fleshy, coral-red (drying black) and minutely papillose-puberulous, the axis 1–2·5 cm. long, bracts and bracteoles minute and inconspicuous ; corolla shortly urceolate, 3–4 mm. long, with short recurved lobes. . . . 8. *A. acuminata* D. Don ex G. Don

Leaves entire, or sometimes appearing very shallowly crenate, due to distant shallow indentations :

Leaves scattered more or less regularly along the branches, showing little or no tendency to be pseudo-verticillate :

Leaves 9–24 cm. long, corollas 2·7–5 cm. long :

Leaves ample, 13–24 cm. long and 6–11 cm. wide ; submarginal nerve conspicuous ; petiole stout :

Leaves obovate, submarginal nerve very strong, 1–2 mm. within margin, margin entire or with very faint indications of distant denticulations, petiole very short (about 4 mm. long) ; inflorescence densely glandular-setose, calyx-segments elongate, subulate, 1 cm. long ; corolla slightly ventricose, 4 cm. long, contracted at the mouth, lobes narrowly triangular, 6 mm. long, suberect . . . . . 9. *A. marginata* Dunn

Leaves ± elliptic, sometime slightly ovate or obovate, submarginal nerve evident but slenderer, scarcely 1 mm. from the margin, margin sometimes conspicuously shallowly crenate-indentate, petiole 5–10 mm. long and 4–5 mm. thick ; inflorescence puberulous or glabrous ; calyx-seg-

†See Notes, *infra*.

ments shortly ovate-triangular, acuminate, 3–4 mm. long ; corolla subcylindric, 2·8 cm. long, not contracted at the mouth, lobes triangular, 4 mm. long, reflexed at the apex. 10. *A. pubiflora* Airy Shaw†

Leaves 2·3–4·7 cm. wide, petiole much less robust :

Leaves (10) 13–18 cm. long, (2·2) 3–4·7 cm. wide, rounded at base ; inflorescence terminal, corymbose, axis 1–4 cm. long, pedicels (2) 3–3·5 cm. long ; calyx-segments subulate, free or almost free, 8–9 mm. long :

Inflorescence about 10-flowered, axis 3–4 cm. long, pedicels angled ; corolla narrowly infundibular, strongly pentagonal, about 5 cm. long, segments elongate-triangular, 9–10 mm. long, erect-spreading . . . 11. *A. hilli* Brandis

Inflorescence 2–4-flowered, axis 1 cm. long, pedicels ± terete ; corolla unknown ; doubtfully distinct from *A. hillii* . . . 12. *A. megacarpa* W. W. Smith

Leaves 9–12·5 cm. long, 2·3–2·8 cm. wide, attenuate at base ; inflorescence axillary or below the leaves, fasciculate, pedicels 2·2–2·5 cm. long ; calyx-segments short, deltoid-triangular, about 2 mm. long ; corolla somewhat ventricose, 4–4·5 cm. long, segments triangular-subulate, 8–9 mm. long, revolute . . . . . 17. *A. variegata* (Roxb.) D. Don ex G. Don var. *macrantha* (Hook.) Airy Shaw

Leaves 5–9 (–12) cm. long, corollas about 2·5 cm. long, slender or very slender :

Corolla divided to about ¼, quite straight, 4–9 mm. wide when pressed ; leaves sometimes slightly glaucous beneath, rather gradually attenuate-acuminate, with rather deeply impressed nerves . . . . . 20. *A. lobbii* C. B. Clarke

Corolla divided to ½ into long linear segments (ultimately revolute), distinctly oblique at the tip in bud (shown also by the exserted style at anthesis), 3–6 mm. wide when pressed; leaves not glaucous beneath, more abruptly caudate-acuminate, with nerves usually not or less conspicuously impressed, prominently reticulate in the young growth . . . . . 21. *A. saligna* (Hook. fil.) Hook. fil.

Leaves more or less collected into false whorls (pseudo-verticillate) at the apices of, or at intervals along, the branches :

Receptacle (calyx-tube or inferior ovary) with a projecting ring of tissue giving the appearance of a cup surrounding the base of the calyx-segments* ; cupular expansion of the pedicel-apex also very conspicuous, 4–4·5 mm. in diameter, spreading ; pedicels not thickened upwards ; corolla cylindric, 2·5–2·7 cm. long ; leaves firmly coriaceous, oblong or narrowly elliptic-oblong,

* Cf. also *A. parishii* var. *annulata* Airy Shaw (p. 000), which has a rather similar ring of tissue.

†See Notes, *infra*.

9–12 cm. long, 1·7–3·6 cm. wide, rounded or shortly narrowed at base, subsessile, acuminate at apex, venation not very conspicuous . . . . . 24. *A. brandisiana* W. E. Evans

Receptacle without a projecting ring of tissue ; cupular expansion of pedicel-apex not so conspicuous, except in *A. auriculata* :

Cupular expansion of pedicel-apex very conspicuous, 4–4·5 mm. in diameter, spreading ; pedicels not thickened upwards ; inflorescences mostly terminal, up to 5 together ; axis 3–6 cm. long, pedicels 2–2·5 cm. long ; calyx-segments subulate, 4 mm. long ; corolla 1·7–2 cm. long, narrowly conical, somewhat abruptly expanded at the apex where the shortly ovate lobes surround the large capitate stigma ; leaves lanceolate-elliptic, 13–18 cm. long, 4–6 cm. wide, rounded or subcordate at base, subsessile, acute but scarcely acuminate at apex, smooth and shining on both surfaces ; venation (including submarginal vein) conspicuous . . . . . 3. *A. auriculata* (Griff.) Hook. fil. †

Cupular expansion of pedicel-apex much less conspicuous, less than 4 mm. in diameter, or if as much then the pedicel gradually thickened upwards :

Calyx-segments very large, oblong-lanceolate, 1·5–1·8 cm. long, almost free or united for 5–6 mm. ; corolla very large, 5–6 cm. long, 1·8 cm. wide when pressed, somewhat ventricose, segments 1 cm. long, erect-spreading ; inflorescence-axis 3–15 mm. long ; leaves oblong-lanceolate to elliptic-lanceolate (or oblanceolate in var. *oblanceolata* Airy Shaw, p. 000), very similar to those of *A. auriculata*, 16–24 cm. long and 5–7 cm. wide, venation conspicuously reticulate . . . 2. *A. burmanica* W. E. Evans*†

Calyx-segments much smaller, less than 1 cm. long ; corolla mostly smaller, mostly less than 5 cm. long, occasionally up to 5·8 cm., less than 1·6 cm. wide when pressed:

Mature expanded corollas 6–16 mm. in diameter (across widest part of tube) when pressed ; leaves almost always strongly pseudo-verticillate :

Mouth of corolla slightly or markedly oblique (sometimes more evidently in the bud stage) ; corolla 2–3 cm. long :

Calyx rather widely cupuliform, thinly puberulous, the segments united for $\frac{1}{3}$ or nearly $\frac{1}{2}$ of their length, deltoid-acuminate, 7–8 mm. long ; receptacle (inferior ovary) globose, densely grey-pubescent ; inflorescence-axis 1–2·5 cm. long, densely grey-pubescent, pedicels 8–19 mm. long, thinly puberulous, bracts and bracteoles small but conspicuous, brown ; corolla broadly cylindric, 2·5–3 cm. long, 5–10 mm.

* Included in the key here for a second time (cf. p. 000) as the denticulation of the leaves is sometimes practically obsolete.

†See Notes, *infra*.

wide when pressed, segments elongate, narrowly triangular, 9–13 mm. long, recurved ; filaments very long for the Series *Robustae*, 2·2 cm. long, anthers only 1·5 cm. long, exserted very obliquely from the mouth of the corolla ; leaves obovate-oblanceolate, 6–11 cm. long, 2–4·3 cm. wide, acuminate, rounded at base, subsessile . . . . . 15. *A. moorei* Hemsl.

Calyx not cupuliform, glandular-setose, setose and puberulous, or glabrous, the segments almost free, generally subulate or sublinear, rarely up to 6 mm. long (var. *macrosepala* Airy Shaw) ; receptacle not globose, not densely grey-pubescent, variously setose or rarely glabrous (var. *roylei* (Kurz) Airy Shaw) ; inflorescence similarly various ; bracts and bracteolates minute ; corolla broadly cylindric, 2–3 cm. long, 6–9 mm. wide when pressed, segments short, 3–5 mm. long ; filaments 3–4 mm. long, anthers 14–15 mm. long, not so conspicuously obliquely exserted ; leaves very variable . . . . . 16. *A. setigera* D. Don ex G. Don*

Mouth of corolla quite straight in all stages :

Corolla cylindric or more often broadly fusiform-ventricose, somewhat contracted at mouth, 3–6 cm. long ; anthers with small spurs on the back ; leaves very variable in size and shape ; plant a few feet in height . . . . . 17. *A. variegata* (Roxb.) D. Don ex G. Don†

Corolla smaller than in *A. variegata* (except forms of var. *glabrata*), 2–2·5 cm. long, cylindric or slightly campanulate, not or scarcely constricted at the mouth except in bud, tube not inflated, slightly thinner and more satiny in texture than *A. variegata*, and the lobes narrower and more acute ; anthers not spurred on the back ; leaves as variable as in *A. variegata* and practically indistinguishable from them ; plant a few feet high . 18. *A. parishii* C. B. Clarke †

Corolla widely infundibular-campanulate, gradually widening to 1–1·8 cm. at the mouth (when pressed) ; receptacle (inferior ovary) subglobose ; calyx widely cupular, 2–3 mm. long, lobed about half-way, segments triangular-acuminate, spreading ; leaves elliptic, acute, very shortly petioled ; plant a few inches high only . . . . . 19. *A. campanulata* (Kurz) C. B. Clarke

* Included in the key here for a second time (cf. p. 78), as the denticulation of the leaves is sometimes practically obsolete.
†See Notes, *infra*.

Mature expanded corollas 3–7 mm. in diameter when pressed ; leaves sometimes more or less scattered, or less conspicuously pseudo-verticillate :

Corolla 2–3 cm. long :

Inflorescences racemose or corymbose, with an elongate axis up to 7·5 cm. long ; corolla distinctly curved at apex :

Leaves subsessile, rounded at base, nerves finely reticulate on both surfaces but not very prominent ; receptacle (inferior ovary) ellipsoid, slightly constricted below calyx ; no cupular expansion at apex of pedicel ; calyx-segments united half-way. . . . . 22. *A. macrostemon* (Kurz) C. B. Clarke

Leaves cuneate at base, narrowed into a petiole 8–10 mm. long, main nerves deeply impressed above and very prominent below, finer nerves inconspicuous ; receptacle not constricted below calyx ; pedicel with distinct cupular expansion at apex ; calyx-segments almost free . . . . . 23. *A. nuttallii* C. B. Clarke

Inflorescence a sessile or subsessile fascicle ; corolla quite straight throughout ; leaves cuneate at base, narrowed into a petiole 5–10 mm. long, nerves rather finely reticulate on both surfaces but not very prominent ; receptacle not constricted below calyx ; pedicel with slight cupular expansion at apex ; calyx-segments united for about 1 mm. ; species closely related to *A. odontocera* (p. 88) but with larger, thinner, shallowly and obscurely crenate (not shallowly dentate) leaves . . . . . 14. *A. pulcherrima* (Hook.) Hook. fil.

Corolla less than 1·8 cm. long :

Leaves large, broadly ovate or elliptic or lanceolate, 8–17 cm. long, 3–5·5 cm. wide, more or less rounded or subcordate at base :

Inflorescence elongate, axis 1·5–5 cm. long ; calyx-segments shortly deltoid to triangular, 1–3 mm. long ; leaves sometimes obscurely denticulate-serrate . . . . . 4. *A. glabra* (Griff.) C. B. Clarke*

Inflorescence abbreviated or fasciculate, axis rarely up to 6 mm. long ; calyx-segments lanceolate, 7–8 mm. long ; leaves shallowly and distantly crenate . . . . . 5. *A. sikkimensis* Airy Shaw†

* Included in the key here for a second time (cf. p. 78), as the denticulation of the leaves is sometimes practically obsolete.
†See Notes, *infra*.

Leaves smaller and much narrower, 6–11·5 cm. long, 1–2 cm. wide, base more or less cuneate or narrowed into the petiole :

Nervation prominent and beautifully reticulate on both surfaces, margin not or scarcely revolute ; leaves thinly coriaceous, broadest generally above the middle, base very gradually attenuate into the petiole ; corolla 1·5–1·7 cm. long, with short ovate-triangular lobes . . . . . 25. *A. salicifolia* C. B. Clarke

Nervation very indistinct on both surfaces, margin strongly revolute ; leaves very rigidly coriaceous, generally broadest at or below the middle, base more broadly narrowed into the petiole ; corolla small (but immature on the only specimens known), 5–8 mm. long, lobed almost to the base 26. *A. nana* (Griff.) Hook. fil.

Notes

2. **Agapetes burmanica** *W. E. Evans* in *Notes Roy. Bot. Gard. Edinb.* **15,** 199 (1927) ; Airy Shaw in *Bull. Misc. Inf.*, Kew, **1935**, 27 (1935).

Var. **oblanceolata** *Airy Shaw*, var. nov., foliis conspicue oblanceolatis nec oblongo- vel elliptico-lanceolatis distincta.

Upper Burma. Sine loc. exact., in fruit, Nov. 1925, *Forrest* 27719 : " Flowers [sic!] large and very richly coloured." Myitkyina distr. : Laukhaung Ritsaw Rd., alt. 900 m., 28 March 1938, *Kermode* 16666 (typus, Herb. Kew.) : " Epiphytic, 5–6 ft. high. Fruit reddish green."

Forrest 27719, cited above, was included in the species by Evans (*l.c.* 200) without comment, nor was any reference made to the oblanceolate leaves in his description. The status of this form (which superficially gives the impression of a distinct species) needs investigating from more ample material.

3. **Agapetes auriculata** (*Griff.*) *Hook. fil.* in Benth. et Hook. fil. *Gen. Plant.* **2** (2), 571 (1876) ; C. B. Clarke in Hook. fil. *Fl. Brit. Ind.* **3,** 444 (1881) ; Brandis, *Ind. Trees*, 405 (1906).

Thibaudiae sp. (cum descr.), Griff. *Itin. Notes*, 124, no. 429 (1848).

Thibaudia auriculata Griff. *Ic. Plant. Asiat.* **4,** p. xi, t. 508 (1854), et *Not. Plant. Asiat.* **4,** 300 (1854) (*nomen tantum*).

Vaccinium auriculatum (Griff.) Kurz in *Journ. As. Soc. Beng.* **46,** ii, 214 (1877).

The name *Thibaudia auriculata* was published in an unsatisfactory manner. No description accompanied the name in Griffith's posthumous *Icones* and *Notulae*, nor did the plate contain any dissections of parts. The description in the *Itinerary Notes* consisted merely of the collector's field notes ; no specific name was associated with it, nor was it connected up with the subsequently published plate, though after the heading " Thibaudiae sp. " Griffith wrote " Icon. It. Boot. t. 27 ". The number " 429 ", prefixed to this entry, appears also on a small label, apparently

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FIG. 1, *Agapetes sikkimensis* Airy Shaw.—1, branch, showing pseudo-verticils of leaves, × ½. 2, portion of branch, with inflorescence, *natural size*. 3, calyx, with one sepal removed to show disc, × 2. 4, [illegible], × 2. 5, stamen, ventral view, × 2.

in Griffith's hand, attached to one of his sheets in Herb. Kew., and seems to be the only evidence to indicate that these field notes belong to *Thibaudia auriculata.*

It may also be pointed out that Griffith's plate shows a plant with markedly, though distantly, serrate leaves, and pedicels gradually enlarged towards the apex without any evident sudden cupular expansion. But Griffith's specimens have entire or remotely crenate-indentate leaves, and pedicels not enlarged upwards but with a sudden very conspicuous cupular expansion at the apex. It seems possible that the drawing was made partly from specimens of *Thibaudia glabra* Griff., which sometimes has leaves and pedicels similar to those figured for *T. auriculata. T. glabra* was, however, figured independently on t. 514,—with hairy leaves, as commented on by Clarke (*l.c.* 444) ! The drawings in Griffith's *Icones* are very crude, and should doubtless not be taken too seriously.

Additional material seen :—

E. Bhutan. Changkar, Trashigong–Diwangiri Road, alt. 1500 m., 6 Nov. 1934, *Ludlow & Sherriff* 1110 (Herb. Mus. Brit.) : " Shrub of 10–12 ft., on oak tree." Jiri Chu, lat. 27° 8′ N., long. 92° 29′ E., alt. 1200 m., 11 Nov. 1938, *Ludlow, Sherriff & Taylor* 7236 (Herb. Mus. Brit.) : " Weak shrub up to 6′ in forest ; pedicels crimson ; calyx lobes green, tube flushed pink ; corolla tube deep pink at base, green at apex, lobes green ; filaments white, anthers brown."

5. **Agapetes sikkimensis** *Airy Shaw* in *Bull. Misc. Inf.*, Kew, **1935,** 29 (1935).

The drawing (fig. 1) is taken from one of the *Hooker* specimens (Teesta, 1500 m., May 7) for the leafy shoot, from *Clarke* 13685 B* (the type) for the flowers, and from *Clarke* 27668 A for the fruits.

7. **Agapetes angulata** (*Griff.*) *Hook. fil.* in Benth. et Hook. fil. *Gen. Pl.* **2,** 572 (1876) ; Airy Shaw, *l.c.* 30 ; Merr. in *Brittonia,* **4** (1), 157 (1941).

Ceratostema angulatum Griff. *Notul.* **4,** 302 (1854) et *Ic. Pl. Asiat.* t. 503 (1854).

Additional material seen :—

Upper Burma. Kaban Tam, 675 m., Jan. 1912, *Toppin* (*Khampti Long Mission*) 6057 ; Nam Tesang, 750 m., Feb. 1912, *Toppin* 6356 : " Flowers salmon pink." (Both in Herb. Calc.). According to a note by M. S. Ramaswami on the folder of the Toppin specimens it was also collected by *Wallace*, 1895–96, in the Hukung Valley, one of the original localities in which it was obtained by Griffith in March 1837 (see Griff. *Journ. Trav.* 69 : 1847).

10. **Agapetes pubiflora** *Airy Shaw*, *l.c.* 27 (1935) ; Merr. in *Brittonia,* 4 (1), 159 (1941).

Described from two collections of Kingdon Ward (nos. 9118 (type) and 10168, Herb. Mus. Brit.) from Upper Burma and adjacent Tibet. The accompanying drawing (fig. 2) was made from the type.

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* Misprinted " 13865 B", *l.c.* (1935).

FIG. 2, *Agapetes pubiflora* Airy Shaw.—1, portion of branch, showing leaf-bases, *natural size*. 2, leaf, upper surface, × 2/3. 3,portion of branch, with inflorescence, *natural size*. 4, two stamens, dorsal view, × 2. 5, stamen, side view, × 2. (From *Kingdon Ward* 9118, in Herb. Mus. Brit.)

Additional material seen :—

China. Yunnan : Kiukiang Valley, Tsunwangtu, upon tree stump in wood, rare, 1600 m., 21 Nov. 1938, *T. T. Yü* 21058 : " Epiphytic shrub, vine-like. Leaf leathery. Flower reddish purple, marked with yellow and purple veins on mouth ; inflorescence a fascicle."

Var. **glabra** *Airy Shaw*, var. nov., nervis secundariis magis prominentibus, inflorescentia glaberrima, pedicellis brevioribus 10–18 mm. (nec 18–25 mm.) longis distincta.

Upper Burma. Kaban Tam, 675 m., Jan. 1912, *Toppin* (*Khampti Long Mission*) 6058 (Herb. Calc.).

"Agapetes variegata".—In the *Flora of British India*, **3**, 446 (1881), this name was used by C. B. Clarke for the plant described by Wight, *Ic. Pl. Ind. Or.* **4** (1), 4, t. 1187 (1848), as *Vaccinium odontocerum*. This, in my view, was erroneous. The following review of the history of the epithet *variegata*, in various combinations, may help to make the position clear.

1814.	Roxb. *Hort. Beng.* 33:	*Ceratostema variegatum* (nomen).	A.
1829.	Wall. *Numer. List*, 751:	*Thibaudia variegata* 'Wall. in herb. 1824'. (citing " Ceratostema Roxb.")	B.
1832.	Roxb. *Fl. Ind.* **2**, 413:	*Ceratostema variegatum* (c. descr.) (et icon ined. in Herb. Kew.)	A.
1834.	G. Don, *Gen. Syst.* **3**, 862:	*Agapetes variegata* 'D. Don in herb.' (c. descr.) (citing "Thibaudia variegata Wall. cat. 751" only : *Ceratostema variegatum* Roxb. is nowhere mentioned, but " Ceratostema species Roxb." is cited under the generic description.)	B.

Two species are here involved : I have indicated them above by A and B. But it is evident that neither Wallich nor Don realised this fact. Wallich, in his herbarium list (1829), thought that his no. 751, which he called *Thibaudia variegata*, was the same plant as that listed as *Ceratostema variegatum* by Roxburgh in his *Hort. Beng.* (1814), since he cites " Ceratostema Roxb." as a synonym. Roxburgh's validating description of *C. variegatum* in *Fl. Ind.* (1832), and his unpublished painting preserved in Herb. Kew., show, however, that his (Roxburgh's) plant was the species later described as *Agapetes grandiflora* Hook. fil. Don's description (1834) of Wallich's specimen, which was in fact the species subsequently described by Wight (1848) as *Vaccinium odontocerum*, cannot, in my opinion, be taken as establishing *Agapetes variegata* as a new name—the valid one for species B—since Don explicitly cites as a synonym *Thibaudia variegata* Wall., which was itself based on *Ceratostema variegatum* Roxb., which had already been validly published by the time Don's description appeared. Wallich and Don undoubtedly thought they were dealing with the same

species as Roxburgh, and though Don accompanied the publication of the name *Agapetes variegata* by a description of Wallich's material, that name must be regarded nomenclaturally as a new combination based on a misidentification, and must be typified by *Ceratostema variegatum* Roxb., to which it ultimately harks back.

The adjusted synonymy of the two species concerned is given below.

13. **Agapetes odontocera** (*Wight*) *Hook. fil.* in Benth. et Hook. fil. *Gen. Plant.* **2**, 571 (1876).

Vaccinium odontocerum Wight, *Ic. Pl. Ind. Or.* **4** (1), 4, t. 1187 (1848).

Caligula odontocera (Wight) Klotzsch in *Linnaea*, **24**, 28 (1851).

[*Thibaudia variegata* (nec *Ceratostema variegatum* Roxb.)—Wall. *Numer. List*, no. 751 (1829).]

[*Agapetes variegata* (nec *Ceratostema variegatum* Roxb.)—D. Don ex G. Don, *Gen. Syst.* **3**, 862 (1834) ; C. B. Clarke in Hook. fil. *Fl. Brit. Ind.* **3**, 446 (1881), pro parte, et auctt. plur.]

Assam. Khasia Hills : M. Pundua, 182–?, *M. R. Smith* in *Wallich* 751 ; sine loc. exact., 1837, *Griffith* ' 312 ', ' 313 ' (Herb. Lemann. ; not these numbers in *Itin. Notes*, 20) (Kew distrib. no. 3472) ; Chura, alt. 1200 m., June 1850, *Hooker & Thomson* ; Nonglam, alt. 1200 m., 12 Nov. 1871, *C. B. Clarke* 15426D, 15455. Naga Hills : Kohima, 1500 m., 12 April 1935, *N. L. Bor* 2980 : " Corolla pink with wavy purple lines."

17. **Agapetes variegata** (*Roxb.*) *D. Don ex G. Don, Gen. Syst. Gard. & Bot.* **3**, 862 (1834) ; Dunal in DC. *Prodr.* **7**, 554 (1839), et auctt. al., quoad synon. Roxb. tantum, excl. descr. !

Ceratostema variegatum Roxb. *Hort. Beng.* 33 (1814) (nomen), *Fl. Ind.* **2**, 413 (1832) (descr.) et *Ic. ined.* 2247 in Herb. Kew. ! Griff. *Notul.* **4**, 302 (1854) et *Ic. Pl. Asiat.* t. 502 (1854).

Agapetes grandiflora Hook. fil. in Benth. et Hook. fil. *Gen. Pl.* **2**, 571 (1876) ; C. B. Clarke in Hook. fil. *Fl. Brit. Ind.* **3**, 446 (1881).

It does not seem possible to maintain *A. macrantha* (Hook.) Hook. fil., *A. loranthiflora* D. Don ex G. Don and *A. variegata* (*A. grandiflora*) specifically distinct. The two latter, particularly, show such a range of variation that one is forced to the conclusion that one polymorphic species is involved. The following arrangement of varieties within the broad species *A. variegata* is therefore proposed, bringing also into the scheme the cultivated plant *A. speciosa* Hemsl., which obviously belongs here.

Var. **glabrata** (*C. B. Clarke*) *Airy Shaw*, comb. nov.

Ceratostema variegatum Roxb., *l.c.*, et Griff., *l.c.* !

Agapetes grandiflora Hook. fil. in Benth. et Hook. fil. *l.c.* ; C. B. Clarke in Hook. fil. *l.c.*

Agapetes loranthiflora var. *glabrata* C. B. Clarke in Hook. fil. *Fl. Brit. Ind.* **3**, 446 (1881).

[*Agapetes parishii* (nec C. B. Clarke)—Airy Shaw in *Bull. Misc. Inf.*, Kew, **1935**, 31 (1935), *pro parte*.]

Burma. Lime[stone] rocks, banks of the Atsan, Moolmein, *Lobb* (lectotypus, Herb. Kew.) : " Shrub, 3 feet, red." On trees and rocks, lowlands of Moolmein, *Lobb*. Tenasserim, *Helfer* (Kew distrib. no.) 3477. (These three gatherings formed the type material of Clarke's var. *glabrata*.) Sandoway distr.: Gwa chaung, found on *Excoecaria agallocha*, sea-level, 7 March 1929, *C. E. Parkinson* 8835 : " Epiphytic shrub with swollen spindle-shaped stems. Fls. scarlet. Beaks of anthers spurred." Tavoy distr. : Kalonta, Tavoy Range, 7·5 m., 23 Dec. 1929, *Sukoe* 10811 : " Epiphyte. Fl. purple. Ls. tufted, in false whorls ". Vernacular name, *kyebaung*. Bhomoriaghona, Cox's Bazaar div., epiphyte in ' garjan forest ', 26 Nov. 1933, *Champion* 1114.

Assam. Mishmi (Naga) Mountains, Yoomta (?), in arbor., March 1837, *Griffith* (type of *A. grandiflora*). Cachar, " Shapone kookee poonjee ", 19 March 1873, *Ramdane* for *R. L. Keenan* : " Parasitical upon a tree. This is probably the same as was got in Doarbund jungle—see. Note the crowded leaves."

This is the " type " variety. The corolla ranges from 3 cm. long in Lobb's specimens to 5·8 cm. long in Griffith's, but this range does not appear to be correlated with any other significant differences. The pedicels and calyx are glabrous, and the leaves are generally more or less rounded or very broadly cuneate at the base.

Var. **macrantha** (*Hook.*) *Airy Shaw*, comb. nov.

Thibaudia macrantha Hook. in *Curt. Bot. Mag.* **77,** t. 4566 (1851).

Vaccinium variegatum var. *macranthum* (Hook.) Kurz in *Journ. As. Soc. Beng.* **42** (2), 84 (1873).

Agapetes macrantha (Hook.) Hook. fil. in Benth. et Hook. fil. *Gen. Pl.* **2,** 571 (1876).

Burma. Kola Mountains, on trees, *Lobb* 535.

This, like var. *glabrata*, has glabrous pedicels and calyx, but differs in the leaves being gradually acuminate at base and apex, and in the absence of the spurs on the back of the anthers.

Var. **speciosa** (*Hemsl.*) *Airy Shaw*, stat. nov.

Agapetes speciosa Hemsl. in *Gard. Chron.* ser. 3, **41,** 230, fig. 101 (1907), et in Fedde, *Rep. Spec. Nov.* **6,** 319 (1909) ; Stapf in *Bot. Mag.* **150,** t. 9040 (1924).

Burma (?). So far known only in cultivation ; accidentally introduced with an orchid about 1900.

This also has glabrous pedicels and calyx, but differs from all the other varieties in the broadly elliptic-obovate leaves with shortly cordate bases.

Var. **puberula** *Airy Shaw*, var. nov., setis glanduligeris omnino deficientibus, sed pedicellis receptaculis calycibus minute puberulis.

Lower Burma. Bassein distr. : Kyathaung chaung, Mezali reserve, 5 Dec. 1927, *Kermode* 7325 : " Flowers red ". Vernacular name : *kyibaung*.

Var. **elegans** (*Kurz*) *Airy Shaw*, comb. nov.

Thibaudia loranthiflora Wall. *Numer. List* No. 754 (1829) (*nomen nudum*).

Agapetes loranthiflora D. Don ex G. Don, *Gen. Syst. Gard. & Bot.* **3,** 862 (1834).

Vaccinium loranthiflorum (D. Don ex G. Don) Dunal in DC. *Prodr.* **7,** 554 (1839).

Vaccinium verticillatum (D. Don ex G. Don) Kurz var. *elegans* Kurz in *Journ. As. Soc. Beng.* **42** (2), 84 (1873) et **46** (2), 214 (1877).

V. verticillatum ?var. *grandiflorum* Kurz, *ll. cc.*

Burma. Tavoy, orae Tenasserim, *W. Gomez* in *Wallich* 754 (type of *Thibaudia loranthiflora* Wall. [*nomen nudum*] and *Agapetes loranthiflora* D. Don ex G. Don). Prome Hills, *Maingay* (Kew distrib.) 703. Nat-toung Mts., 1861, *Rev. Mr. Cross.* Tavoy, on trees, *Rev. C. Parish* 326 : " Thibaudia near setigera but seemingly undescribed ". (The last two specimens are written up in Kurz's handwriting " *Vaccin. verticillatum macranthum* ", and are probably to be regarded as type material of *V. verticillatum* ?var. *grandiflorum* Kurz.) Pegu Yomah, E. and W. slopes : top of Kambala toung, 3,200′, 24–26 Feb. 1871, *Kurz* 2993 (type of *V. verticillatum* var. *elegans* Kurz). Pegu Yoma, 450 m., 6 Jan. 1906, *Lace* 2878. S. Shan States : Tapot to Pinka, in evergreen forest, 1050 m., *Robertson* 85 : " Epiphyte ". Amherst distr. : Lampa Chaung, 900 m., 3 Feb. 1912, *Lace* 5659. Tavoy : S.W. headwaters of the Heinze Chaung, 360 m., 10 Feb. 1919, *Gage* (or *P. T. Russell*) 94 : " Corolla pink ; already collected under another number [not seen] ". (5 sheets in Herb. Calcutta). Amherst distr. : Ye-Winyaw watershed, 60 m., 12 Jan. 1927, *Parkinson* 5017 : " Epiphytic. Flowers reddish pink, darkening slightly in fading." Mergui distr. : Palauk chaung, on rocks, 180 m., 17 Jan. 1930, *Parker* 3096 : " Shrub 3 m. high."

Var. *elegans* differs from the " type " variety (var. *glabrata.*) in its glandular-setose pedicels, receptacle and sepals. The flowers vary considerably in size, as in var. *glabrata.*

18. **Agapetes parishii** *C. B. Clarke* in Hook. fil. *Fl. Brit. Ind.* **3,** 445 (1881) ; Airy Shaw in *Bull. Misc. Inf.*, Kew, **1935,** 31 (1935).

A more detailed investigation into *A. parishii* and *A. variegata* (Roxb.!) D. Don, *s.l.*, shows that certain specimens were wrongly referred to *A. parishii* in my earlier paper. These were : the Cachar (Assam) specimen of *R. L. Keenan*, the Sandoway specimen of *C. E. Parkinson* (8835), and the Mergui specimen of *R. N. Parker* (2585). They must evidently be placed under *A. variegata* (see vars. *glabrata* and *elegans*), in spite of their small flowers. It is sometimes very difficult to separate these two species, but the characters emphasized in the key (*supra*, p. 100) are usually sufficient for the purpose.

Two marked variations of *A. parishii* seem worth recognizing.

Var. **cultrata** *Airy Shaw*, var. nov., foliis anguste oblique lanceolato-ellipticis vel cultriformibus basi cuneato-angustatis apice valde tenuiter caudato-acuminatis textura tenuiter chartaceis.

Assam. Lushai Hills : Chakang, alt. 1500 m., Feb. 1927, *Mrs. A. D. Parry* 120 (Herb. Kew.) : " A parasite (?) on trees—red flowers—long thin pointed leaves ".

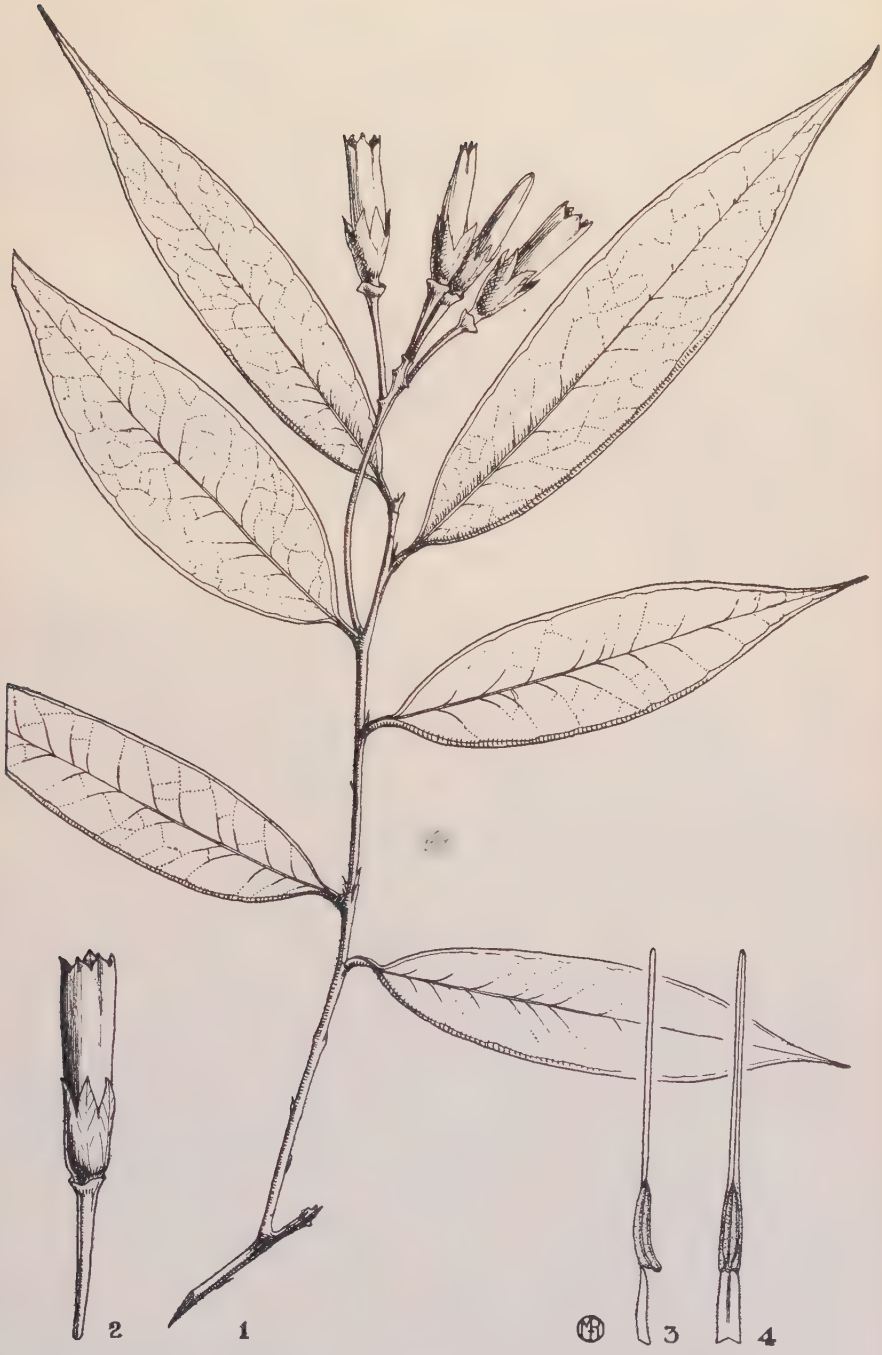

FIG. 3, *Agapetes pseudo-griffithii* Airy Shaw.—1, branch with leaves (upper surface) and inflorescence, × 2/3. 2, flower, × 2. 3, stamen, side view, × 2. 4, stamen, ventral view, × 2. (From *Kingdon Ward* 9144, in Herb. Mus. Brit.)

This recalls forms of *A. pulcherrima* (Hook.) Hook. fil. in the leaf-shape, but the inflorescence-characters point unmistakably to *A. parishii*.

Var. **annulata** *Airy Shaw*, var. nov., receptaculo (ovario vel calycis tubo) basin versus annulo prominulo ei *A. brandisianae* W. E. Evans simili aucto.

Upper Burma. Southern Shan States : Lakut to Molye, alt. 1500 m., Feb. 1910, *W. A. Robertson* 91 A (Herb. Kew.).

I included this specimen under *A. parishii* without comment in 1935, having overlooked the curious annulus at the base of the receptacle, which is clearly homologous with the remarkable structure found in *A. brandisiana*.

Series Graciles

(For key to species, see *Bull. Misc. Inf.*, Kew, **1935,** 38–39.)

Agapetes pseudo-griffithii *Airy Shaw*, *l.c.* 40 ; Merr. in *Brittonia*, **4** (1), 159 (1941).

The illustration (fig. 3) is drawn from the type specimen, *Kingdon Ward* 9144 (Herb. Mus. Brit.), collected in the Nam Tamai valley of Upper Burma.

Var. **filipes** *Airy Shaw*, var. nov., pedunculis pedicellisque gracillimis subfiliformibus nec carnosis ; ob calycem breviter lobatum cum var. *abbayano* Airy Shaw (*l.c.* 41) comparanda.

Upper Burma. Nga uka, 420 m., Feb. 1912, *Toppin* (*Khampti Long Mission*) 4389 (Herb. Calc.).

It is possible that this variety would be better placed under *A. angustifolia* (Knagg) Airy Shaw (*l.c.* 40), which has similar filiform pedicels. The leaves, however, which in this genus seem to provide the best specific characters, are almost exactly those of *A. pseudo-griffithii*.

Series Longifiles

(For key to species, see *Bull. Misc. Inf.*, Kew, **1935,** 44–46, and *infra*, p. 96.)

Agapetes saxicola *Craib* in *Bull. Misc. Inf.*, Kew, **1935,** 334 (1935).

This Siamese species may be fitted into my key to the Series *Longifiles* (*l.c.* 44), after *A. Pottingeri* Prain, as follows :—

Leaves obovate-oblong, 2–3 cm. long, completely rounded at apex ; calyx-teeth short, about equalling tube ; corolla divided about half-way . . . . . *A. saxicola* Craib

Agapetes adenobotrys *Airy Shaw*, *l.c.* 46 (1935) : Merr. in *Brittonia*, **4** (1), 157 (1941).

The illustration (fig. 4) represents the so far unique specimen (*Kingdon Ward* 9099, Herb. Mus. Brit.) of this interesting species.

Agapetes cauliflora *Merr.* in *Journ. Arn. Arb.* **19,** 59 (1938).

By the courtesy of the Keeper of the Herbarium of the Arnold Arboretum, I have been able to examine the type of this species, described

FIG. 4, *Agapetes adenobotrys* Airy Shaw.—1, branch with leaves (upper and lower surface) and inflorescence, *natural size*. 2, calyx, receptacle and upper part of pedicel, showing double indumentum, ×2. 3, stamen, side view, × 4. 4, stamens, dorsal view, × 4. (From *Kingdon Ward* 9099, in Herb. Mus. Brit.)

from Tonkin. It may be fitted into my key to the *Longifiles* (*l.c.*, top of p. 45) by substituting for the *A. oblonga* paragraph the following :—

Leaves 4–11·5 cm. long ; flowers fascicled ; receptacle long-setose :

Branches leafy almost throughout ; leaves up to 11·5 cm. long ; pedicels up to 2 cm. long ; filaments glabrous (Upper Burma, Yunnan)..... *A. oblonga* Craib

Branches leafy only at tips, bare below ; leaves up to 6 cm. long ; pedicels 5–6 mm. long ; filaments sparingly pubescent (Tonkin) *A. cauliflora* Merr.

Agapetes forsan sp. nov., peraff. *A. spissae* Airy Shaw.

Upper Burma. Hills east of the Mali Hka, 27° 30′ N., alt. 1500 m., 31 July 1937, *F. Kingdon Ward* 12872 (Herb. Mus. Brit.) : " A small epiphytic shrub in the rain forest. Fruiting ; fruit covered with long bristly hairs."

The leaves are slightly broader, blunter and thinner in texture than those of *A. spissa*, and the nervation is rather closer and considerably finer. As far as can be judged from the material, the branching is much less dense. The young fruits are covered with long ferrugineous setae, but this does not constitute a point of distinction from *A. spissa* : my original description of that species was misleading in stating that the receptacle was " subtiliter pubescens ", since it is much more commonly long-setose as well as finely pubescent, as in the related species *A. brachypoda*, *A. pensilis*, etc. The present plant is so close to *A. spissa* that I do not feel justified in describing it as distinct from the fruiting material available.

Agapetes brachypoda *Airy Shaw*, *l.c.* 51 (1935) et in *Hook. Ic. Pl.* **33**, t. 3257 (1935).

Var. **gracilis** *Airy Shaw*, var. nov., caulibus elongatis (usque 75 cm. vel ultra) gracilibus (1–1·5 mm. diametro), foliis multo angustius ellipticis vel obovato- vel oblongo-ellipticis 1·4–1·9 cm. longis 0·7–1·0 cm. tantum latis basi late sed plerumque distincte cuneatis, pedicellis receptaculis corollisque longe subferrugineo-glanduloso-setosis tantum nec insuper breviter albo-pubescentibus, corolla obscure rubra a typo distincta.

Burma-Yunnan Border. Ridge above Laktang (Kang fang route), growing on the lower side of mossy boughs, 2400 m., 25 May 1919, *Kingdon Ward* 3066 (Herb. Edin.) : " At intervals along the stem are curious balls, like small marbles. These may be for storing water or starch. Flowers pendent, dull red."

Best treated as a variety of *A. brachypoda* until further material shows the differences to be of specific value.

Agapetes epacridea *Airy Shaw*, sp. nov., ex affinitate *A. brachypodae* var. *gracilis* A.S., sed foliis multo minoribus ovatis usque suborbicularibus apice longe mucronato-pungentibus diversa, atque in genere distinctissima.

Frutex epiphytica, e collectore multiramosa, sed ramis lectis elongatis parce ramosis crebre foliatis dense patenti-setosis setis primo ferrugineis

demum fusco-brunneis. *Folia* parva, carnosula, ovata usque suborbicularia, 8–12 mm. longa, 4–7 mm. lata, basi subrotundata vel late cuneata, apice in mucronem conspicuum pungentem acutissimum abruptiuscule desinentia, margine valde revoluta, integerrima, apicem versus ciliis paucis longis in statu juvenili glandulosis praedita, ceterum utrinque glabra, laevia, supra nitidula, siccitate rugosula, nervis obscuris, subtus obscure rubella ; petiolus vix 1 mm. longus. *Flores* ut videtur parce editi, axillares, pedicello 4–5 mm. longo dense patenti-glanduloso-pubescente et insuper dense brevissime albo-puberulo basi bracteis paucis minutis brunneis suffulto. *Receptaculum* (post anthesin tantum cognitum) obovoideum, 2–2·5 mm. diametro, dense patenti-glanduloso-setosum et albo-puberulum. *Calycis* segmenta in cupulam apertam ut videtur altiuscule connata, late triangulari-ovata, acuta. *Corolla* et *stamina* ignota. *Fructus* (immaturus) subglobosus, 7 mm. diametro, apice truncatus, dense longe glanduloso-setosus, stylo persistente.

Upper Burma. A common epiphyte in the warm temperate *Castanopsis–Quercus* hill forest on the ranges between the Nam Tamai and Nam Tisang subtropical hill jungle region, lat. 27° 35′ N., long. 97° 40′ E., alt. 1800 m., 5 Dec. 1937, *F. Kingdon Ward* 13540 (Herb. Mus. Brit.) : "A much branched epiphytic shrub, the long branches at first erect, later drooping, clothed with long hairs and with closely set small fleshy leaves, glabrous or with a few marginal bristles. Flowers solitary, axillary. Fruits very large, hairy (not ripe) ".

The pungent-tipped leaves of this very distinct species suggest some Epacridaceous plant. In spite of the corolla and androecium being unknown, there is no doubt of its affinity with *A. brachypoda*.

Agapetes vernayana *Merr.* in *Brittonia*, **4** (1), 159 (1941).
Additional material seen :—

Upper Burma. E. flank of Imaw Bum, in rain forest on big trees, 2100–2400 m., 27 Sept. 1919, *F. Kingdon Ward* 3697 (Herb. Edin.) : " Pendent epiphyte with potato-like outgrowths on the stems, which are everal feet in length. Flowers pale greenish yellow."

Closely related to *A. pensilis* A.S., but quite distinct in its larger, thinner, very convex leaves, with very distinct venation, and midrib ending in a distinct thickened whitish apiculus.

In *Bull. Misc. Inf.*, Kew, **1935,** 51 (1935), when discussing the reduced inflorescence of this group of *Agapetes*, I suggested that " field-observations on the type of insect-visitor frequenting the flowers " might be of interest. Such observations are not yet forthcoming, but in one of the flowers of *Kingdon Ward* 3697 two minute flies were found, close to a hole in the corolla and to a corresponding damaged part of the filaments, about a third of the distance from the base. Dr. F. I. van Emden, of the Imperial Institute of Entomology, was good enough to examine them for me ; they were found to be an undeterminable species of *Sciaridae* or *Cecidomyiidae*.

Agapetes anonyma *Airy Shaw*, sp. nov., affinis *A. pensili* A.S. et *A. vernayanae* Merr., sed foliis tenuiter chartaceis subtiliter serrulatis recedit : ab *A. spissa* A.S., foliis serratis gaudente, distinguitur foliis ovatis nec

cuneato-obovatis, circumcirca serrulatis nec basin versus integris, obscuris nec lucidis, multo tenuioribus, costa nervisque multo minus elevatis.—*Agapetes* sp. nov., Airy Shaw in *Bull. Misc. Inf.*, Kew, **1935,** 53 (1935).

Fruticulus parvus, epiphyticus, plus minus scandens, ramis haud elongatis 10–15 cm. longis 1–2 mm. crassis laxe ferrugineo-pilosis. *Folia* ovata, rarius late ovata vel elliptico-ovata vel oblongo-ovata, 1·5–2·5 cm. longa, 0·9–1·8 cm. lata, basi late cuneata usque rotundata, apice acuta, rarius subobtusa, margine subtiliter et crebre crenulato-serrulata, angustissime reflexa vel fere plana, denticulis brevissime aristulatis, utraque pagina glaberrima (nisi subtus setula hinc inde secus costam suppetente), tenuiter chartacea, sicca viridia ; costa nervisque gracilibus supra elevatis subtus levissime prominentibus, nervis lateralibus 6–8-iugis ; petiolis brevissimis circiter 1 mm. longis. *Flores* solitarii vel bini, pedicellis 3–4 mm. longis densissime ferrugineo-setosis basi perulis parvis circumdatis. *Corolla* et *stamina* ignota. *Fructus* globosus, 4–5 mm. diametro, dense et longe ferrugineo-setosus, calycis segmentis emarcidis circiter 2 mm. longis coronatus.

Assam. Delei Valley, 28° 15′ N., 96° 35′ E., alt. 2100–2700 m., 25 Aug. 1928, *F. Kingdon Ward* 8585 (Herb. Kew.) : " A small straggling epiphytic undershrub of the forest, southern slope. In fruit."

In 1935 (*l.c.*) I refrained from describing this, in the absence of flowers. But there is no doubt as to its affinity, since the most important distinctions between the species of this group lie in the foliage, and it therefore seems desirable to describe it.

Revised Key to Subsessile-Flowered Group of Series *Longifiles*

(see *Bull. Misc. Inf.*, Kew, **1935,** 46)

Flowers subsessile or very shortly pedicellate (pedicel rarely up to 5 mm. long), solitary ; corolla pubescent outside ; filaments pubescent ; anthers bicalcarate :

Leaves quite glabrous beneath (rarely with an occasional seta on the midrib) :

Leaves 8–12 mm. long, ovate to suborbicular, rigidly coriaceous and fleshy, abruptly or subabruptly narrowed into a long pungent mucro . . . . . *A. epacridea* Airy Shaw

Leaves larger, never ending in a pungent mucro, though sometimes bluntly apiculate :

Leaves rigidly and thickly coriaceous, entire, with revolute margins . . . . . *A. brachypoda* Airy Shaw

Leaves subcoriaceous to thinly chartaceous, conspicuously crenulate-serrate, margins not markedly reflexed :

Leaves elliptic-obovate with a cuneate base, subcoriaceous, shining, subentire towards the base, with conspicuous, fine, elevate nervation . . . . . *A. spissa* Airy Shaw

Leaves ovate with a rounded base, thinly chartaceous, dull, finely serrulate almost to the base, nervation much less elevate . . *A. anonyma* Airy Shaw

Leaves more or less pubescent beneath :

Leaves 1·5–2·4 cm. long, rigidly but thinly coriaceous, sub-bullate, longly and loosely pilose below, nervation distinct . . . . . *A. vernayana* Merr.

Leaves 1–1·6 cm. long, rigidly and thickly coriaceous, flat, very sparingly and shortly pilose on both surfaces when mature but rather densely pubescent when young, nervation impressed above and very obscure below . . . . *A. pensilis* Airy Shaw

Series Pteryganthae

Series **Pteryganthae** *Airy Shaw*, ser. nov. Caules plerumque robusti, sed interdum graciles et flexuosi ; folia mediocria vel parva, plerumque serrata, haud vel vix pseudo-verticillata ; inflorescentiae corymbosae vel fasciculatae ; tubus vel calycis vel corollae conspicue pentagonus vel alatus, calycis segmentis saepe amplis membranaceis ; corolla interdum flava ; filamenta brevissima ; antherae saepius dorso calcaratae.—Typus, *A. incurvata* (Griff.) Sleumer.

This series comprises the genus *Pentapterygium* Klotzsch in *Linnaea*, **24,** 16, 47 (1851) ; C. B. Clarke in Hook. fil. *Fl. Brit. Ind.* **3,** 449 (1881) ; and an interesting new species described below (p. 00). Klotzsch's genus was based exclusively on *P. serpens* (Wight) Klotzsch (*Vaccinium serpens* Wight), but I prefer to typify the Series *Pteryganthae* by a more characteristic member of the group, and have therefore selected *A. incurvata* (Griff.) Sleumer [*Gaylussacia incurvata* Griff. (1848) ; *Pentapterygium rugosum* (Hook. fil. et Thoms. ex Hook., 1856) Hook. fil.] and have adopted a different name for the Series. I now fully concur with Sleumer (in Engl. *Bot. Jahrb.* **70,** 95–97 : 1939) in reducing *Pentapterygium* to *Agapetes* ; my earlier remarks on this subject (*Bull. Misc. Inf.*, Kew, **1935,** 40) were in any case provisional.

Key to the Species.

Leaves more than 2 cm. long and 1 cm. wide, or if less not arranged regularly along the whole length of the branches ; anthers spurred on the back :

Leaves serrate throughout, or occasionally entire at the extreme base ; nerves markedly impressed above :

Entire inflorescence (including corolla) minutely but evidently puberulous ; calyx large, about 1·5 cm. long ; corolla yellow . *A. flava* (Hook. fil.) Sleumer

At least the calyx glabrous :

Pedicels (especially upwards) and corolla (on the angles) minutely pubescent or ciliate ; calyx-segments usually very broad and rounded, up to 6–7 mm. wide ; corolla rather short, 1·5–1·7 cm. long . . . . . *A. hookeri* (C. B. Clarke) Sleumer

Pedicels and corolla quite glabrous ; calyx-segments usually less broad ; corolla longer, 2–2·3 cm. long . . . . . *A. incurvata* (Griff.) Sleumer

Leaves serrate only in the distal half or at the apex, or quite entire (rarely one or two teeth below the middle) :

Corolla elongate-cylindric, 2–3 cm. long ; calyx 1–2 cm. long :

Leaves smooth and shining above, often entire or toothed near the extreme apex only ; corolla some shade of red, or green, lobes long and narrow, about 8 mm. long . . . . . *A. interdicta* (Hand.-Mazz.) Sleumer

Leaves quite dull above, toothed in the distal quarter or third ; corolla bright yellow, lobes deltoid-acuminate, 2–3 mm. long . . . . . *A. borii* Airy Shaw

Corolla shortly cylindric or subconical, 1–1·2 cm. long ; calyx 5–7 mm. long :

Leaves 4–7·5 cm. long, lanceolate-elliptic ; young branches glabrous or minutely puberulous, but not densely hispid-setulose ; calyx-segments broad and rounded, sometimes minutely apiculate . . . . . *A. listeri* (King ex C. B. Clarke) Sleumer

Leaves 1·5–3·5 cm. long, obovate or elliptic-obovate ; young branches densely hispid-setulose ; calyx-segments ovate-acuminate . . . . . *A. smithiana* Sleumer

Leaves less than 2 cm. long and 1 cm. wide, regularly arranged along almost the whole length of the slender arching or creeping branches ; anthers not spurred on the back :

Leaves lanceolate, or rarely ovate, 1–2 cm. long, distinctly serrulate and often aristate-mucronate ; calyx 5-winged, corolla cylindric, about 2 cm. long, unwinged . . . . *A. serpens* (Wight) Sleumer

Leaves very small, very broadly elliptic to suborbicular, 6–7 mm. long, obscurely crenate-serrate or subentire ; calyx unwinged ; corolla urceolate, 7–8 mm. long, broadly 5-winged . . . . . *A. miranda* Airy Shaw

Enumeration

1. **A. flava** (*Hook. fil.*) *Sleumer* in Engl. *Bot. Jahrb.* **70,** 105 (1939).

Pentapterygium flavum Hook. fil. in Hook. *Bot. Mag.* **82,** t. 4910 (1856) ; C. B. Clarke in Hook. fil. *Fl. Brit. Ind.* **3,** 450 (1882).

Bhutan. " Gomerer to Dupla " [Duphla Hills], *Booth* (for Nuttall). Cult. in Hort. Nuttall, Rainhill, Lancs., 1856 (typus, Herb. Kew.).

Booth's original specimen of this scarce species was in ripe fruit, from seeds of which the plant which supplied the flowering material for the type was eventually raised. The species appears never to have been collected since.

2. **A. hookeri** (*C. B. Clarke*) *Sleumer, l.c.* 106.

[*Gaylussacia serrata* (nec Lindl. 1839)—Griff. *Itin. Notes,* 37, 125 (1848).]

Pentapterygium hookeri C. B. Clarke in Hook. fil. *Fl. Brit. Ind., l.c.*

Sikkim. Kursiong, 1200–1800 m., 3 Aug. 1849, *Hooker* : " Florib. purp. rubris. Stamin. basi corollae fixis filam. brevib. basi hirtis. Stigma

clavat. cap." Choongtam Hill, 1200–1800 m., 28 Oct. 1849, *Hooker*. Darjeeling, 1800 m., 11 June 1870, *C. B. Clarke* 12043 : " Corolla green yellow with 5 plications. Stamens 10. Anthers red. Pollen white." Darjeeling, 2100 m., 21 July 1870, *C. B. Clarke* 12187. Darjeeling, 2250 m., 21 Aug. 1870, *C. B. Clarke* 12444. Yoksun, 1950 m., 17 Oct. 1875, *C. B. Clarke* 25378 (Herb. Mus. Brit.). Darjeeling, 2190 m., 17 Aug. 1875, *C. B. Clarke* 27025 : " Root large epiphytic. Sepals 5 green adnate to ovary and produced below. Corolla clear yellow, slightly pilose without ; tube with 5 sharp angles, mouth small. Stamens 10. Anther beaks spurred. Pollen small, white." Rungbool, Darjeeling, 2250 m., July 1874, *Gamble* 3636 : " Epiphyte ; flrs. greenish-yellow." Khursiong, 2100 m., 10 Oct. 1884, *C. B. Clarke* 36500 A (Herb. Mus. Brit.) : " Duplicate of the clear yellow corolla one. Shrub, epiphytic, 6 feet." Sine loc. exact., 1800 m., *Beddome* 4757 (Herb. Mus. Brit.).

Bhutan. Bailfa (Bulphai), c. 2040 m., Jan. 1838, *Griffith* 445 (Kew distrib. no. 3464).

Assam. Khasia Hills, towards Mamloo, Oct. 1837, *Griffith* 604. Khasia, reg. temp., 12–1500 m., *Hooker & Thomson* (Herb. Mus. Brit.) Khasia, Lailankote, 1500 m., 29 Nov. 1871, *C. B. Clarke* 14804 A (Herb. Mus. Brit.) : " Species unlike the others by broad sepals, pubescent shoots, serrulate leaves." Shillong, 1800 m., 9 Aug. 1885, *C. B. Clarke* 38628 J (Herb. Mus. Brit.).

Also *cult.* at Botanic Gardens, Glasnevin, Dublin, June 1921, as " Thibaudia sp. ? Peru. *Sander*."

It is doubtful if this ought to be treated as anything more than a variety of *A. incurvata* ; in vegetative characters the two seem indistinguishable. However, the character of the puberulous or glabrous pedicels seems constant in the material available, and they may provisionally be kept separate. Clarke cited Griffith's Bhutan specimen under *Pentapterygium rugosum*, but the pedicels are puberulous at the apex.

3. **A. incurvata** (*Griff.*) *Sleumer, l.c.* 105.

Gaylussacia incurvata Griff. *Ic. Pl. Asiat.* t. 506 (1854).

Vaccinium rugosum Hook. fil. et Thoms. ex Hook. *Bot. Mag.* **82,** sub t. 4910 (1856).

Pentapterygium rugosum (Hook. fil. et Thoms. ex Hook.) Hook. fil. *Bot. Mag.*, **86,** t. 5198 (1860) ; C. B. Clarke in Hook. fil. *Fl. Brit. Ind. l.c.*

Sikkim. Sine loc. exact., 1800 m., 21 Oct. 1874, *Treutler* " 971 ? "

Bhutan. Balfai, near Trashigong, 6500′, epiphytic on oak trees, 26 June 1934, *Ludlow & Sherriff* 568 (Herb. Mus. Brit.) : " Suffused pink, with tranverse wavy blood-red streaks." Youpu La (E. Bhutan), 2250 m., 10 Nov. 1938, *Ludlow, Sherriff & Taylor* 7224 (Herb. Mus. Brit.) : " Epiphyte, hanging down from trees, in immature forest."

Assam. Khasja Hills : Amwee, in sylvis, epiphytica, Nov. 1837, *Griffith* 1217 (Kew distrib. no. 3465) : " Calyce colorato rubro 5-angulato. Corolla cylindracea, profunde 5-angulata, dentibus erectis, albida, venis rubris transversis oblique, dentibus viridibus demum lake-coloured.

Calyce demum saturate viridia." Khasia, Churra, 18 June 1850, 1200–1500 m., *Hooker & Thomson* 1060 : "Corolla 5-winged, calyx do., lined red." Khasia, Kalapanee, 6 Aug. & 28 Oct. 1850, 1200–1500 m., *Hooker & Thomson* s.n. Khasia, sine loc. exact. vel dat., *Fielding*.

Also *cult.* in Hort. Bot. Reg. Kew., Aug. 1903, determined as "*Pentapterygium flavum* Hook. f., forma."

Clarke cited the Treutler specimen from Sikkim under *Pentapterygium hookeri*, but the pedicels are quite glabrous.

4. **A. interdicta** (*Hand.-Mazz.*) *Sleumer*, *l.c.* 106 ; Merr. in *Brittonia*, **4** (1), 158 (1941).

Pentapterygium interdictum Hand.-Mazz. in *Anz. Akad. Wiss. Wien*, **60**, 186 (*Pl. Nov. Sin.* no. 27, p. 7) (1923) ; Evans in *Notes Roy. Bot. Gard. Edinb.* **15**, 202, fig. 1 B, 207 (1927) ; Hand.-Mazz. *Naturb. südw.-China*, 239 (1927), *Symb. Sin.* **7** (2), 799 (1936).

Assam. Chibaon, Delei Valley, 28° 10′ N., 96° 30′ E., 2100–2400 m., 12 April 1924, *Kingdon Ward* 8082 : "A fairly common epiphyte of the mixed forest, as a straggling shrub. Flowers borne on the old wood, usually in twos. Pedicel and calyx crimson. Corolla crimson, with purple black V-shaped marks ; the tips pale green, curled right back.'

Upper Burma. On forest trees in the hills around Tzi-tzo-ti, 25° 58′ N., 98° 28′ E., 2100 m., May 1925, *Forrest* 26585 : "Epiphytic shrub of 2 ft. Flowers purplish rose." Base Camp, Seinghku Wang, epiphytic in the tanglewood forest, 2700 m., 28 May 1926, *Kingdon Ward* 6784 : "Calyx and corolla scarlet, the latter with pale green recurved teeth. When the corolla has fallen the huge red calyx looks like another flower!" Myitkyina District : top of Hpare Valley, 2400 m., 5 April 1938, *Kermode* 17166 : "Epiphyte 3–4 feet high. Calyx scarlet. Corolla green."

N.W. Yunnan. Above Schutsche on the Taron (Kiu-chiang, upper course of the Irrawaddy), lat. 27° 55′ N., 2400–2800 m., 9 July 1916, *Handel-Mazzetti* 9465 type [not seen].

Var. **stenoloba** (*W. E. Evans*) *Sleumer*, *l.c.* 106.

Pentapterygium interdictum var. *stenolobum* W. E. Evans in *Notes Roy. Bot. Gard. Edinb.* **15**, 207 (1927).

Upper Burma. Salwin–Kiu Chiang divide, 27° N., 98° 35′ E., on ledges and in crevices of cliffs, 3000–3300 m., July 1924, *Forrest* 25678 : "Evergreen shrub of 3 ft. Branches pendulous. Flowers? Fruits dull rich crimson." Ibid., Oct. 1924, *Forrest* 25802. Valley of the Seinghku, 28° 5′ N., 97° 30′ E., epiphytic in the upper rain forest, on big oak trees, etc., 2400–2700 m., 25 Sept. 1926, *Kingdon Ward* 7457 : "Flowers over, but some in bud. Calyx green, in fruit becoming flushed red."

In Kingdon Ward's specimen (no. 7547) the fruiting calyx measures 2·2 cm. in total length and the segments are 6–7 mm. in width at the base, as against 1·8 cm. and 3–4 mm. in Forrest's original. But it seems to represent the same form, though I doubt whether the latter is sharply distinguishable from the type of the species.

5. **Agapetes borii** *Airy Shaw*, sp. nov., *A. interdictae* (Hand.-Mazz.) Sleumer forsan proxima, corolla anguste cylindrica laete flava breviter lobata, foliis supra opacis nec lucidis statim distinguenda.

Frutex epiphyticus ? *Rami* 3–4 mm. crassi, conspicue angulati (angulis e foliorum basibus decurrentibus), glabri, cortice pallido. *Folia* obovata vel elliptico-obovata, 3·8–4·7 cm. longa, 1·5–2 cm. lata, basi rotundata, sessilia, apice acuta, margine levissime reflexa, apicem versus crenato-denticulata ceterum integra, chartaceo-coriacea, utrinque glaberrima, siccitate fusco-brunnescentia, costa gracili utrinque prominente, nervis lateralibus gracillimis 8–9-jugis subrectis adscendentibus prope marginem procurvis et anastomosantibus. *Inflorescentiae* fasciculares, usque 3-florae. *Pedicelli* circiter 1 cm. longi, graciles, hinc inde brevissime glandulosо-setulosi, basi bracteolis minutis brunneis paucis instructi. *Calyx* totus 10–11 mm. longus, glaber : tubus circiter 3 mm. longus, basi intrusus, quinque-alatus, alis basi rotundatis ; segmenta 7–8 mm. longa, 3 mm. lata, lanceolata, acuta, membranacea, venosa. *Corolla* anguste cylindrica, 2·5–2·8 cm. longa, inferne 4–5 mm. superne 6–7 mm. diametro, pentagona, glabra, laete flava (teste collectore), ut videtur lineis transversis anfractuosis etiam notata, lobis deltoïdeis 2–2·5 mm. longis acuminatis acutis patulis. *Stamina* 2·2–2·3 cm. longa : filamenta 2–3 mm. longa, anguste subulata, glabra ; antherae circiter 2 cm. longae, thecis oblongis papillosis 6 mm. longis in aristas 1·4 cm. longas rectas laeves ecalcaratas superne cohaerentes desinentibus. *Stylus* 2·8–2·9 cm. longus, glaber, stigmate haud expanso. *Fructus* ignotus.

Assam. Naga Hills : Saramati Ridge, alt. 1800–2700 m., 11 March 1935, *N. L. Bor* 2913 (Herb. Kew.) : " Flowers bright yellow."

The material consists of a twig 9 cm. long bearing eight leaves and five flowers, only two of the latter having corollas. The species nevertheless seems distinct enough to describe. The narrowly cylindric bright yellow corollas should be characteristic.

6. **A. listeri** (*King ex C. B. Clarke*) *Sleumer*, *l.c.* 105.

Pentapterygium listeri King ex C. B. Clarke in Hook. fil. *Fl. Brit. Ind.* **3**, 450 (1882).

Bhutan. Sine loc. exact., *Booth* (for Nuttall).

Assam. Torapatti, Duphla Hills, 2100 m., 1874, *Lister* : " Exaristate anthers."

7. **A. smithiana** *Sleumer*, *l.c.* 106.

Pentapterygium sikkimense W. W. Smith in *Rec. Bot. Surv. Ind.* **4**, 268 (1911), nec *Agapetes sikkimensis* Airy Shaw 1935.

Sikkim. Lachen, trunks of trees, 2700 m., 3 Aug. 1849, *Hooker* (sterile) ; also flowering branch mounted with specimens of *A. hookeri* from Choongtam and Kursiong, *Hooker*. Darjeeling, 2100 m., Feb. 1882, *Gamble* 10270. Hooker's Camp, Zemu Bridge, 1886, *H. J. Elwes*. Lachung Valley, 2250 m., 14 Sept. 1892, *Gammie* 1216 (typus) : " Epiphytic shrub."

8. **A. serpens** (*Wight*) *Sleumer*, *l.c.* 105.

Vaccinium serpens Wight, *Ic. Pl. Ind. Or.* **4** (1), 4, t. 1183 (1848), *Ill. Ind. Bot.* **2,** 119, t. 141, D 2 (1850) ; Hook. fil. *Ill. Himal. Pl.* t. 15 *B* (1851).

Thibaudia myrtifolia Griff. *Itin. Notes*, 125 (1848) ; *Notul.* **4,** 301 (1854) ; *Ic. Pl. Asiat.* t. 510 (1854).

Pentapterygium serpens (Wight) Klotzsch in *Linnaea*, **24,** 47 (1851) ; C. B. Clarke in Hook. fil. *Fl. Brit. Ind.* **3,** 449 (1882) ; Hook. fil. *Bot. Mag.* **110**, t. 6777 (1884).

Sikkim. Choongtam, 2400–3200 m., 21 May 1849, *Hooker*. Libong, 2100–3200 m., April 1850, *Hooker* : " Epiph." Sine loc. exact., ? 1867, *Lobb* 12. Darjeeling, 2100 m., Dec. 1872, *Gamble* 3671 C : " Epiphytic ; large tuberous roots." Darjeeling, 2100 m., 3 April 1874, *Treutler* : " Epiphyte, forming large tuberous stems." Darjeeling, 2100 m., May 1874, *Gamble* 3673 A. Pasheeling, British Bhutan, 1800 m., March 1875, *Gamble* 3672 A. Darjeeling, 2100 m., 27 March 1876, *C. B. Clarke* 27465 A & B : " Corolla red with zigzag marks, glandulose hairy without, glabrous within. Stamens 10 (anthers with very long connivent points), basifixed." Darjeeling, 2100 m., 13 April 1876, *C. B. Clarke* 27497 (Herb. Mus. Brit.). Mahalderam, Darjeeling, 2100 m., 28 May 1884, *C. B. Clarke* 35153 A (Herb. Mus. Brit.). Darjeeling, banks, c. 2100 m., 8 April 1913, *Lacaita* H III. 449 (Herb. Mus. Brit.) : "An epiphyte; flower crimson-scarlet with darker red, not black; veins." Gangtok, 1500 m., 7 April 1938, *Ludlow, Sherriff & Taylor* 4004 (Herb. Mus. Brit.) : " Low, spreading shrub, commonly epiphytic. Corolla deep maroon with black markings."

Bhutan. Phullong, woods, c. 1800 m., Feb. 1838, *Griffith* 2263. Below Rydang, 1650 m., 24 Jan. 1838, *Griffith* (Kew distrib. no. 3462). Tongsa, c. 2100 m., 13 March 1838, *Griffith* (Kew distrib. no. 3462). Bunakha Timpu, 2100 m., 6 July 1914, *Cooper* 1295 (Herb. Mus. Brit.): " Pink, grey berries." Tsanka, 2250 m., 5 June 1938, *Gould* 389.

Assam. South of the Pankim La, Balipara Frontier Tract, 1500 m., an epiphyte of the lower temperate rain forest, 2 May 1935, *Kingdon Ward* 11371 (Herb. Mus. Brit.).

Also *cult.* in Hort. Bot. Reg. Kew., 20 May 1884 (e coll. H. J. Elwes) and 2 Sept. 1920 ; and in hort. Bennett-Poë, 18 March 1905 (Herb. Mus. Brit.).

Var. **alba** *Airy Shaw*, var. nov., corolla alba, receptaculo et calyce non tantum secus angulos sed etiam inter angulos glanduloso-pubescente, habitu (teste *W. T. Stearn*) diverso.

Sikkim. Between Kalimpong and Algarah, 1500–1800 m., 1946, *W. T. Stearn.*

9. **Agapetes miranda** *Airy Shaw*, sp. nov., ex affinitate *A. serpentis* (Wight) Sleumer, a qua foliis minimis suborbicularibus, calyce exalato, corolla brevi urceolata late quinque-alata flava abunde differt.

Suffrutex prostrata, per muscos in saxis praeruptis repens (testibus lectoribus) ; caules elongati, usque 30–60 cm. longi, circiter 1 mm. crassis parce ramosi, dense setosi, crebre foliati, e parte basali radices tuberosa,

usque 8 mm. diametro edentes. *Folia* parva, latissime elliptica vel suborbicularia, subdisticha, (5) 6–7 (8) mm. longa et 4–6 mm. lata, basi rotundata, apice obtusa vel rotundata plerumque brevissime apiculata, margine reflexa, obscure crenato-serrata (subdenticulata) vel subintegra, rigide coriacea, glaberrima, discoloria (subtus pallida), nervis supra ruguloso-impressis subtus omnino evanidis ; petiolus brevissimus sed distinctus, vix 1 mm. longus, gracilis. *Flores* solitarii, axillares, ut videtur erecti, longipedicellati. *Pedicellus* gracillimus, 10–14 mm. longus, inferne attenuatus, sparsiuscule setosus, paullo supra basin bracteolis paucis minutis brunneis instructus, apice velut in coronulam multiradiatam subulato-laciniatam (vel annulum setarum) calycis basin circumdantem expansus. *Receptaculum* breve, plus minus turbinatum, glabrum. *Calycis* segmenta breviter connata, patula, ovato-deltoïdea, circiter 2 mm. longa et fere aeque lata, breviter acuminata, margine parce denticulato-ciliata. *Corolla* urceolata, 7–8 mm. longa et fere aeque lata, latissime quinque-alata, alis inferne latioribus usque fere 2 mm. latis superne angustatis, glaberrima, carnosula, citrino-flava, fauce angustato, lobis breviter ovato-deltoïdeis circiter 1·5 mm. latis et longis patentibus viridibus. *Stamina* 6·5–7 mm. longa : filamenta subulata, 2–2·5 mm. longa ; antherae lanceolatae, 5 mm. longae, supra basin dorsifixae, minute papil-losae, thecis in rostra simplicia recta ecalcarata desinentibus. *Discus* annularis. *Stylus* 7–7·5 mm. longus, glaber, stigmate minuto expanso. *Fructus* ignotus.

S.E. Tibet. Pachakshiri District : Lalung, lat. 28° 45′ N., long. 94° 15′ E., clinging on to sunny cliff faces, in moss, alt. 2400 m., 6 May 1938, *Ludlow, Sherriff & Taylor* 3718 (Herb. Mus. Brit.) : " Prostrate shrub, 1–2 ft. long. Flowers fleshy, lemon yellow, green at the throat."

This interesting plant once more emphasizes the difficulty of making natural divisions in the genus *Agapetes*. The broadly winged (not merely angled) urceolate corollas represent a unique type in Asiatic *Vaccinioïdeae*. But its true affinity is, I think, indicated by the combination of glandular-setose pedicels with the curious ' collarette ' of laciniae at the apex (observed elsewhere, and less markedly, only in *A. serpens* and *A. lacei* Craib), the yellow colour of the corolla (not found outside the Series *Pteryganthae*), and the short filaments—though this character is no doubt correlated with the short corolla. The wings on the corolla are also undoubtedly an indication of affinity, the wing-forming tendency having been transferred from the outer perianth-whorl to the inner.

In foliage and general appearance, apart from the inflorescence, the species is literally almost indistinguishable from *Vaccinium chaetothrix* Sleumer, collected by Kingdon Ward on the Seinghku Wang and in the Delei valley. The leaves of the latter are perhaps slightly thicker, but I should not care to have to separate sterile material of the two.

Species Excludendae

I cannot support Sleumer's view (in Engl. *Bot. Jahrb.* **70,** 96–7 : 1939) that the Papuasian species of *Agapetes* are referable to Series *Graciles* and *Longifiles*. In fact I strongly incline to the opinion that they are not referable to the genus *Agapetes* at all, but are much more closely allied to *Dimorphanthera*. The genus *Paphia* has already been established for species

of this group, and I should favour its retention. I am convinced that *Paphia* and *Dimorphanthera* represent a distinct ' line '—independent of the *Agapetes* complex—from which it is not difficult to trace the origin of certain groups of *Vaccinium*, such as Sect. *Galeopetalum* J. J. Smith.

Agapetes scortechinii (King et Gamble) Sleumer (*l.c.* 105) (*Pentapterygium scortechinii* King et Gamble) should also, I believe, be excluded from *Agapetes*. It is geographically and morphologically isolated both from *Agapetes* and from *Paphia*. Probably it should constitute a new genus ; I hope to return to this on a future occasion.

The genus *Agapetes*, therefore, in my view, occupies a compact area consisting of the Eastern Himalayas, Assam, Burma, S.W. China and parts of Siam and Indo-China, the species being distributed among the four series as follows :

Series	*Robustae*,	25–26 species
„	*Graciles*,	11–12 „
„	*Longifiles*,	19–20 „
„	*Pteryganthae*,	9 „
	Total,	64–67 species.

THEOBROMA SALTZMANNIANA.

J. E. Rombouts.

The description of *Theobroma saltzmanniana* dates from 1871 when Bernoulli (1) created this species on the ground of an aberrant shape of the ligula of the flower. The diagnosis is :

" Th. petiolis tomentosis, foliis breviter petiolatis, margine vix undulatis, in nervis supra hirsutis, ceterum glabris, e basi aequali obovato-oblongis, acuminatis, penninerviis ; pedunculis unifloris (an semper ?), pilosiusculis ; calycis laciniis lanceolatis, glabris, exciliatis ; petalorum cucullis trinerviis, apice in ligulam longe cuneato-spathulatam reflexam productis ; *ligulae lamina anguste obovata, apice truncato emarginata* ; tubi staminei laciniis sterilibus lineari-subulatis, pilosis, erectis ; fertilibus diantheriferis ; ovario . . . . . fructu . . . . .

Hab. Bahia in convallibus, an sponte ? (Saltzmann).

Theobromati Cacao affinis, sed differt praecipue petalorum figura."

By this description the only difference between *T. saltzmanniana* and the two related species *T. cacao* and *T. leiocarpa*, created by Bernoulli in the same paper, is the shape of the ligula, which for that reason is underlined here in the above diagnosis. This shape is described for the two other above-mentioned species as : " *ligulae lamina rhomboidea, versus apicem subcrenata, acuminata.*" That *T. saltzmanniana* was considered a distinct botanical species only on the ground of the shape of the ligula can be concluded also from the observation given by Bernoulli himself :

" Da bei den mit Theobroma verwandten Arten, wie ueberhaupt bei der ganzen Gattung, die Form der Ligula sehr constant ist, stehe ich nicht an, diese Pflanze also besondere Art aufzustellen. Von

den zwei vorhergehenden Species, Th. leiocarpa und Th. pentagona, habe ich hunderte von Bluethen im frischen Zustande untersucht, und ihre, wenn auch geringen, Unterschiede immer leicht nachweisen koennen. Die Ligula von Th. Saltzmanniana ist von Th. Cacao noch viel abweichender, als die der zwei andern Arten dieser Section."

Bernoulli did not see *T. saltzmanniana* during his journey to Central America, but made his diagnosis of the species from dried material which he found in the Kew Herbarium. At the point where he always indicates in the description of the other Theobromas " v.v." or " v.s. " in one of the great herbaria, he states for *T. saltzmanniana* expressly " v.s. in herb. Kew."

In the Kew Herbarium there are two sheets with material of *T. saltzmanniana.* The first one is stamped " Herbarium Benthamianum 1854." It bears two single leaves, a small piece of bark, the top of a young fruit, and a small branch with three leaves, the latter labelled with the printed legend :

St. Lucia,	Herb. Forsyth.
Anderson	Purchased 1835.

On this label Bentham has written in ink : " Theobroma Cacao." On the sheet is mounted another small piece of paper on which are gummed one flower bud, two flowers, and a third very old flower with a well developed ovary. On this small sheet is written in ink : "Bahia ; in convallibus ; an sponte ?", together with the name " Theobroma Cacao." In the right hand corner at the foot of the herbarium sheet W. B. Hemsley has written " Theobroma Saltzmanniana Bern. in Uebersicht Theobr. 7."

The second sheet is stamped " Herbarium Hookerianum 1867," and bears the name Theobroma Cacao, written in ink by Sir William Hooker. On the sheet is mounted a small piece of paper of exactly the same kind as the one found on the former herbarium sheet. This small sheet bears two paper strips, originally used to fix three (?) flowers, which are no longer present. In the same hand is written on it the same legend as stated for the first herbarium sheet. Below this Sir William Hooker has written : " x Saltzmann " and " L." after the latin name. The herbarium sheet bears only two leaves and also a mounted envelope containing two loose flowers, one badly and one well preserved. Below the envelope is pencilled in Hemsley's handwriting " T. Salzmanniana Bernoulli " (Note the variation in the spelling of the specific name, the same adopted by Schumann, in accordance with the correct spelling of the eponymous collector's name). There is no indication of a type.

I have examined all visible ligulae of the gummed flowers on the first herbarium sheet and I did not find one that corresponds in shape with the description given for *T. saltzmanniana.* All were rhomboid and more or less acuminate. I made a thorough examination of the well preserved flower from the envelope on the second herbarium sheet, after having boiled it up in water. Two of its laminae were broken off, but the remaining three were all rhomboid-acuminate.

This is in agreement with the finding of Schumann, who also examined the Kew Herbarium material, and who writes in his revision of the genus *Theobroma* in the *Flora Brasiliensis* (3) : " De tertia specie *Theobroma salzmanniana* autem certissime dicere possum, ne varietatem levissimam quidem esse. Exempla a Salzmann apud Bahia lecta numerosa examinavi et nunquam ligulam aliam inveni quam normalem; figura mediocriter picta me docet, autorem aut casum teratologicum coram se habuisse, aut, quod verisimilius, in hb. Kewensi plantam non accurate examinasse. Quibus ex causis varietates constituere non audeo."

During my sojourn in the cacao-growing regions of Bahia in 1936/1937 I examined innumerable flowers of the different cacao types, and I have never met a flower which had a ligula of the shape as described for *T. saltzmanniana.*

When we review the Kew Herbarium material, it is certain that it is a mixture of more than one collection. The part on the Herb. Benth. sheet originating from St. Lucia, from the Forsyth herbarium, cannot have been collected by Salzmann. Forsyth died in 1804, whereas Salzmann, who never was in St. Lucia, collected his cacao material in Brazil between 1827 and 1830. The cacao flowers mounted on the small paper sheets were collected by Salzmann, who annotated them himself as belonging to the species *T. cacao.*

It is most likely that Bernoulli's diagnosis was made from the material on the second (Herb. Hook.) herbarium sheet, and probably from the flowers originally fixed by the now empty strips on the small paper sheet. Perhaps the flowers kept in the small envelope are two of these, preserved in this way after being taken from the strips for examination. If so, it is hardly believable that the description by such a scrupulous botanist as Bernoulli was based on an erroneous observation, so that it seems that the author dealt with an occasional anomaly or with a damaged flower, which, however, is no longer present in the herbarium at Kew. The heterogeneous material preserved at Kew, therefore, must now be labelled *Theobroma cacao* L., for the portion of the fruit present agrees with that of this species, even if one maintains *T. leiocarpa* Bern. as a distinct botanical species.

I will end this note with the words of Chevalier (2), which are in full agreement with my own opinion : " *T. Saltzmanniana* n'a pas sa raison d'être, étant établié sur une fleure anormale accidentelle."

References.

(1) Bernoulli, G. " Uebersicht der bis jetzt bekannten Arten von Theobroma."
Neue Denkschriften der allgemeinen Schweizerischen Gesellschaft fuer die gesammten Naturwissenschaften, **24** : 1871.

(2) Chevalier, A. " Révision du genre Theobroma d'après l'Herbier du Muséum national d'Histoire naturelle de Paris."
Revue de Botanique appliquée et d'Agriculture tropicale, **26**, pp. 265–285 : 1946.

(3) Schumann, K., in Martius, Flora Brasiliensis, **12**, pars iii. p. 73 : 1886.

NOTES ON CAREX ; XVI*.

E. Nelmes.

New Chinese Carices.

Kükenthal, in his treatment of *Carex* in Engler's Pflanzenreich, 1909, divides Sect. *Hymenochlaenae* Drejer into six subsections. The fifth of these, *Graciles* Tuckerm., contains six species : five, with androgynaeceous spikes, have a mainly Pacific distribution; the sixth, with a wholly male terminal spike and female or androgynaeceous lateral ones, is confined to the Azores.

In the Kew herbarium are two Chinese species of this subsection which have the sexes arranged as in the Azores species, but differ from it in having narrower leaves, shorter spikes, and much smaller, more strongly nerved, more or less hispidulous utricles.

The following key gives the principal differences between the two species, which are described below.

Clavis specierum.

Culmi 30–35 cm. alti, superne nutantes ; spica feminea suprema masculam haud superans ; squamae femineae 1·5–2·25 mm. longae, 0·6–1 mm. latae, ovato-lanceolatae ; utriculi plerumque leviter curvati, 3 mm. longi, 1 mm. lati, glabri vel interdum superne parcissime hispiduli, rostro 1 mm. longo distincte bilobo, ore obliquo ; nux elliptica ; stigmata utriculo aequilonga . . . . . 1. *Carex pergracilis*

Culmi 17–18 cm. alti, erecti ; spica feminea suprema masculam superans ; squamae femineae 2–2·25 mm. longae, 1·25 mm. latae, ovatae vel oblongo-ovatae ; utriculi stricti, 2·5–2·75 mm. longi, 1–1·25 mm. lati, basi excepta dense albido-hispiduli, rostro 0·5–0·75 mm. longo subintegro, ore haud obliquo ; nux obovata ; stigmata dimidio utriculo paullo longiores . . . . . 2. *Carex chuii*

1. **Carex pergracilis** *Nelmes*, sp. nov.

Rhizoma caespitosum, ut videtur haud stoloniferum. *Culmi* 30–35 cm. alti, inferne erecti, superne nutantes, obtuse trigoni, tenuissimi (0·3–0·4 mm. crassi), laeves (rhachibus inclusis), inferne foliati, basi vaginis aphyllis marginibus dissolutis brunneis vestiti. *Folia* dimidiis culmis sublongiora, 1–1·5 mm. lata, plana vel planiuscula, sicca pallide flavo-viridia, laevia ; vaginae antice pallidae et membranaceae. *Spicae* 4–5, laxiflorae, breviter cylindricae, 5–10 mm. longae, suprema mascula, circiter 1 mm. crassa, ceterae 3–4 femineae, 2–3 mm. crassae, suprema e nodo circiter 0·75–1 cm. infra basin spicae masculae orta, sed pedunculata et cum spica mascula velut fastigiata, ceterae distantes, pedunculatae ; pedunculi tenuissimi, laeves, triquetri vel compressi, (superiores) breviter vel sublonge vel (inferiores) longe exserte pedunculati. *Bracteae* spicarum femearum culmum vaginantes, superiores aristato-vaginiformes, inferiores subfoliaceae, spicis suis sublongiores; vaginae inferiores ventre (antice) membranaceae, subcastaneae, superiores omnino squamiformes, subcastaneae, laeves, glabrae. *Squamae femineae* 1·5–2·25 mm. longae, 0·6–1 mm. latae, ovato-lanceolatae vel interdum oblongo-lanceolatae, apice acutae vel subacutae, superiores interdum obtusae,

cymbiformes vel planiusculae, pallide castaneae, marginibus anguste vel sublate albido-hyalinae, apice demum eroso-ciliolatae, tenues et translucentes, tenuissime multinerves, nervo mediano interdum viridi subvalido, apicem haud vel vix attingente, raro in inferioribus in mucronulam excurrente. *Utriculi* constanter 3 mm. longi, circiter 1 mm. lati, elliptici sed basi et apice attenuati, biconvexi, compresse biconvexi, vel plano-convexi, viridi-spadicei vel rubro-brunnei, minute pallide rubro-nitido-glandulosi, valde multinerves, saepe utrinque glabri et laeves sed interdum superne marginibus et faciebus parcissime hispiduli, membranacei, angustissime marginati, subpatuli, inferne in pseudo-stipitem longum cuneatum attenuati, superne in rostrum glabrum laevem vix vel anguste marginatum marginibus parcissime hispidulum compresso-biconvexum vel plano-convexum plerumque leviter curvatum sed interdum strictum ore obliquum bilobum (lobis lanceolatis pallidis demum erosis) circiter 1 mm. longum attenuati, apicem versus subabrupte contracti. *Nux* 1·6 mm. longa, 1 mm. lata, spadicea, marginibus pallidior, elliptica, compresso-bicon-vexa vel plano-convexa, laevis, haud stipitata, haud vel brevissime pallide rostrata. *Stylus* basin versus pyramidalis. *Stigmata* 2, utriculo subaequilonga.

China. Szechuan : Pao-hsing-hsien, 2800 m., 5 August 1936, *K. L. Chu* 3435.

2. **Carex chuii** *Nelmes*, sp. nov.

Rhizoma caespitosum, ut videtur haud stoloniferum. *Culmi* 17–18 cm. alti, erecti, trigoni, tenuissimi (0·3–0·4 mm. crassi), laeves (rhachibus inclusis), inferne foliati, basi vaginis aphyllis integris brunneis vestiti. *Folia* culmis multo breviora, 1–1·5 mm. lata, plana vel planiuscula, sicca laete flavo-viridia, marginibus apicem attenuatum versus exceptis scabriuscula, laevia vel laeviuscula : vaginae antice membranaceae, pallide brunneae vel pallidae. *Spicae* 4 (–5), laxiflorae, erectae vel suberectae, 7–12 mm. longae : suprema mascula, cylindrica, circiter 1 mm. crassa : ceterae 3 (–4) femineae, raro androgynaeceae, 2–2·5 mm. crassae, oblongo-cylindricae, superiores 2 (–3) approximatae vel subapproximatae, cum spica mascula fastigiatae et suprema eam superans, infima distans, pedunculatae ; pedunculi tenuissimi, laeves, obtuse vel obscure triquetri, breviter vel supremus vix e vaginis exserti. *Bracteae* spicarum feminearum culmum vaginantes, superiores vaginiformes, aristatae, infima subfoliacea, spica sua sublongiores ; vaginae plus minus castaneae, superiores omnino squamiformes, inferiores ventre (antice) membranaceae, ore marginibus albido-hyalinae, laeves et glabrae vel dorso nervis minute et parce hispidulae. *Squamae femineae* 2–2·25 mm. longae, 1·25 mm. latae, ovatae vel oblongo-ovatae, apice plerumque acutae vel subacutae sed interdum obtusae, cymbiformes vel planiusculae, pallide castaneae, marginibus sublate albido-hyalinae plerumque apicem demum eroso-ciliolatae, tenues et translucentes, tenuissime multinerves, nervo mediano viridi apicem versus plerumque valido sed eum haud attingente et nunquam excurrente. *Utriculi* 2·5–2·75 mm. longi, 1·1–25 mm. lati, elliptici sed basi et apicem versus attenuati, biconvexi, compresso-biconvexi, vel plano-convexi, superne

* Continued from K.B. 1940, 272.

atro-rubro-brunnei, inferne pallidiores, valde multinerves, basi glabri vel glabrescentes, ceterum plerumque apice (rostro incluso) dense subadpresse albido-hispiduli, membranacei, anguste marginati, subpatuli, inferne in pseudo-stipitem pallidum longum cuneatum attenuati, superne in rostrum dense hispidulum compresso-biconvexum vel plano-convexum strictum ore haud obliquum subintegrum vel brevissime bilobum (lobis brevissimis pallidis demum erosis) 0·5–0·75 mm. longum attenuati, apicem versus subabrupte contracti. *Nux* (immatura ?) 1·2–1·4 mm. longa, circiter 1 mm. lata, pallide flava, obovata, compresso-biconvexa vel plano-convexa, laevis, haud stipitata, brevissime rostrata. *Stylus* basin versus pyramidalis. *Stigmata* 2, dimidio utriculo haud longiora.

China. Szechuan : Pao-hsing-hsien, 2450 m., 30 June 1936, *K. L. Chu* 3022.

STUDIES IN THE ERICALES : VI*.

Further notes on Gaultheria dumicola W.W.Sm.

H. K. Airy Shaw.

Although the genus *Diplycosia* Bl. is perfectly distinct from *Gaultheria* L., even from those species of *Gaultheria* (Sect. *Brossaeopsis* Ser. *Dumicolae*) which resemble it most, there has been a good deal of confusion between the two. C. B. Clarke, in the *Flora of British India* **3**, 459 (1882), described two species of *Gaultheria* under the names *Diplycosia discolor* (Nutt.) C. B. Cl. and *Diplycosia? semi-infera* C. B. Cl. Japanese botanists, e.g. Nakai in *Bot. Mag. Tok.* **35**, 135 (1921), Makino and Nemoto, *Nipp.-Shokub.-Sôran*, 865 (1931), etc., have repeatedly treated *Gaultheria adenothrix* (Miq.) Maxim. as a *Diplycosia* (cf. my remarks in *Bull. Misc. Inf.*, Kew, **1940**, 315 : 1941). More recently Merrill in *Brittonia*, **4** (1), 153–4 (1941), has described *Diplycosia alboglauca* Merr. and *D. pauciseta* Merr. from Upper Burma, stating of the former that " it somewhat resembles *Gaultheria dumosa* [sic] W. W. Sm." My suspicions having been aroused not only by this statement but by the description and the country of origin, I applied for the loan of the types, and was very courteously sent both these and a number of other specimens, from Yunnan, which Dr. Merrill had provisionally determined as *Diplycosia* sp. All these supposed *Diplycosias* must, in my view, be referred to *Gaultheria dumicola* W. W. Sm., and the following synonymy and citations set this out formally. All specimens cited are in the Arnold Arnoretum herbarium unless otherwise stated.

Gaultheria dumicola *W. W. Smith* in *Notes Roy. Bot. Gard. Edinb.* **9**, 106 (1916) ; Airy Shaw in *Bull. Misc. Inf.*, Kew, **1940**, 312 (1941).

Diplycosia alboglauca Merr. in *Brittonia*, **4** (1), 153 (1941), **syn. nov.**

Yunnan. Shang-pa, in woods, 1800 m., 8 Oct., 1933, *H. T. Tsai* 54817 : " Shrub, 5 ft., flower green." Taron-Taru Divide, Bucahwang, casual on margin of woods on open slope, 1700 m., 29 Oct. 1938, *T. T.*

* Continued from K.B. 1948, p. 104.

Yü 20873 : " Spiny shrub, 1 ft. ; fruit purple ; seeds yellow, fine." Taron-Taru Divide, Tangtehwang, rare among woods on open slope, 2300 m., 7 Nov. 1938 *T. T. Yü* 20999 : " Shrub, 4 ft. ; inflorescence axillary, fascicle ; berry purplish black, globose, 5-lobed."

Var. **aspera** *Airy Shaw, l.c.*

Diplycosia pauciseta Merr. l.c., **syn. nov.**

Var. *aspera* and *D. pauciseta* were both based on the same gathering from Upper Burma—*Kingdon Ward* 9245 (erroneously cited by me, *l.c.*, as ' 9425 '). Merrill cites in addition *H. T. Tsai* 54726 and 54770 from Shang-pa Hsien, Yunnan, which I have seen and confirm as belonging to var. *aspera*. The following specimen extends its range (and that of the species) into Assam :—

Assam. Naga Hills : above Kuladorre, 1950 m., 11 March 1935, *N. L. Bor* 2906 (Herb. Kew).

The leaves in this specimen are very broadly elliptic and more abruptly cuspidate than usual, and the marginal nerve is sometimes as much as 3 mm. from the margin, so that the leaf is clearly quintuplinerved ; it is therefore possible that this Naga Hills form should be regarded as a distinct variety. The material is unfortunately somewhat meagre.

Var. **pubipes** *Airy Shaw*, var. nov., pedicellis sub lente minutissime sed dense puberulis.

Yunnan. Dry open situations in the Machang-Kai Valley, north of Teng-yueh, 25° 20′ N., 1800–2100 m., Feb. 1913, *Forrest* 9568 (Herb. Edin. and Kew) : " Shrub of 6–10 ft. In fruit." Prope Tengyüeh, 1800 m., Oct. 1916, *Schneider* 2561 (Herb. Kew). Shang-pa Hsien, in ravine, 2000 m., 20 Sept. 1933, *H. T. Tsai* 56533 : " *Smilax* ; climber." *Ibid.*, on open slope, 2100 m., 27 Sept. 1933, *Tsai* 56641 ; " Shrub, 6 ft." *Ibid.*, on cliff, 2400 m., very rare, 13 Oct. 1933, *Tsai* 54404 (type) : " Fruit dark red. Climbing shrub, very like *Smilax*, but fruit not Liliaceous." *Ibid.*, in woods, 2000 m., 31 Oct. 1934, *Tsai* 59162 : " Vine ; fruit green." Che-tse-lo, in forest, 3200 m., 12 Sept. 1934, *Tsai* 58538 : " Shrub ; fruit blue."

This is probably a rather unimportant variation ; I can find no other character associated with the puberulous pedicels. *Forrest* 9568 was one of the three original gatherings on which the species was based ; its indumentum is so minute that it forms a link with the " typical " glabrous form.

A NEW SPECIES OF DIOSPYROS L.

J. P. M. Brenan.

Diospyros (*Maba (*J. R. et G. Forst.*) *Bakh.*) **nummularia** *Brenan*, sp. nov. ; affinis *D. Dawei* (Hutch.) Brenan* sed foliis coriaceis minoribus basi plerumque rotundatis differt.

Arbor parva vel mediocris, usque ad 12 m. alta, semperivrens, ut videur dioica. *Ramuli* pernumerosi, juniores satis dense pubescentes, longitudinaliter striolati, subteretes, graciles, 0·5–1·5 mm. diametro, seniores iterum atque iterum ramosi, tarde glabratae, cortice griseo obtecti ; internodia insigniter brevia, 2–7 mm. longa. *Folia* inter generis minima, 0·6–1·7 cm. longa, 0·4–1·35 cm. lata, late ovata usque orbicularia vel subrhomboideo-elliptica, coriacea vel rigide coriacea, apice rotundata vel late obtusa nonnunquam minutissime emarginata, basi plerumque rotundata aliquando breviter et latissime cuneata, supra saepius nitida vel nitidula siccitate brunnea usque atrobrunnea raro viridia glabra vel tantum basm costae versus minute puberula, subtus opaca vel nitidula pallidiora glabra, margine plano vel leviter recurvo saepe praesertim juventute pilis longiusculis sparsis ut videtur caducissimis induto ; costa angusta, supra impressa usque prominula, subtus satis obvia et plus minusve prominula, nervis lateralibus utrinque costae latere 4–6 cum aliis secundariis aegre discernendis rete venularum conjunctis, omnibus supra inconspicuis vel omnino evanidis subtus plerumque prominulis ; petiolus brevissimus, 1–2·5 mm. longus, basi articulatus, supra sulcatusm more ramulorum vestitus. *Alabastra inflorescentiarum* ♂ *et* ♀ ovoidea vel elliptica, leviter compressa, circiter 2·5–3·5 mm. longa, squamis pluribus (tantum 6–8 extrinsecus conspicuis) distichis arcte imbricatis rigidis dorso convexis usque ad 2·5 mm. longis 3·5 mm. latis (explicatis) margine albo-ciliolatis aliter glabris operta ; squamae basales nonnullae basi inflorescentiarum maturarum saepe persistentes. *Flores* ♂ in inflorescentiis axillaribus brevissimis 2–4-floris dispositi ; rhachis 0·5–2·5 mm. longa, sicut pedicelli 0·75–1·5 mm. longi minute pubescens. *Calyx* cupularis, 2–3 mm. longus, 2–2·5 mm. latus, basi sulco annulari conspicue articulatus, apice truncatus, margine integro albo-ciliolato excepto glaber. *Corollae tubus* campanulatus, 2–3 mm. longus, 2–2·5 mm. diametro, extra glaber vel tantum superne sparse sericeus ; lobi 3–4 breviter oblongi vel subquadrati, 2–2·5 mm. longi, circiter 2 mm. lati, apice rotundati et medio paululum deflexi, extra dense sericei, intus glabri. *Stamina* 12–14 ; filamenta brevissima, 0·1–0·5 mm. longa, glabra, basi corollae tubi inserta ; antherae lineari-oblongae usque lineari-triangulares, 1·5–2 mm. longae, glabrae. *Ovarium* nullum. *Flores* ♀ in inflorescentiis axillaribus unifloris dispositi ; pedunculus (pedicello incluso) 1–2 mm. longus, pubescens, cicatricibus squamarum delapsarum notatus. *Calyx* anthesi usque ad 2·75 mm. latus, aliter ut in mare ; in statu fructifero accrescens, 3·5 mm. longus, 5–5·5 mm. latus, fructum arcte amplectens. *Corollae* tantum trilobatae visae, lobis usque ad 2·5 mm. latis, aliter ut in mare. *Staminodia* 9, circiter 1 mm. longa, basi corollae tubi inserta. *Ovarium* ovoideo-conicum, circiter 1·75 mm. altum,

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* **Diospyros dawei** (*Hutch.*) *Brenan*, comb. nov.—*Maba Dawei* Hutch. in Kew Bull. 1912, 330-331.

1·5–2 mm. latum, glabrum, triloculare, loculis biovulatis. *Stylus* 0·75–1 mm. longus, stigmatibus brevissimis. *Fructus* obovoideo-ellipsoideus vel ellipsoideus, 7–8 mm. longus, 4·5–6 mm. latus, stylo persistenti (nonnunquam etiam corolla) apiculatus, monospermus, pericarpio laevi modice tenui. *Semen* ellipsoideum, 7 mm. longum, 4·5 mm. latum, atrobrunneum vel subargenteum, pulcherrime ac densissime verruculosum, unilateraliter sulcatum, etiam linea impressa angustissima longitudinaliter circumcinctum ; endospermium crassissimum, corneum, haud ruminatum.

Southern Rhodesia. Mazoe District : Amen Spruit, 1310 m., May 1917, *F. Eyles* 707 (Herb. Kew., barren) :—small irregularly shaped tree under deep shade. Granite-boulder country at Msonneddi, 26 Sept. 1937, *G. M. McGregor* M.125/37 (Herb. Imp. For. Inst., Oxon., barren) :—bush 2 m. high. Salisbury District : 1585 m., June 1920, *F. Eyles* 2273 (Herb. Kew., barren) :—spreading shrub or tree. Salisbury, 1370 m., April 1922, *F. Eyles*, 3414 (typus in Herb. Kew., fruiting) :—bushy evergreen tree 2–6 m. high, common among granite rocks ; leaves dark green, glossy. Goromonzi, 1585 m., 1 Jan. 1927, *F. Eyles* 4601 (Herb. Kew., ♀ flowers) :—between rocks on top of granite hill. Water's edge at " The Springs ", Salisbury 28 May 1931, *A. A. Pardy* 4786 (Herb. Imp. For. Inst., Oxon., barren). Salisbury District, 19 Dec. 1937, *G. M. McGregor* M.159/37 (Herb. Imp. For. Inst., Oxon., ♂ flowers) :—tree 6 m. high. Chindamora Native Reserve, 15 May 1946, *Mr. Palgrave* Palg. 1/46 (Herb. Imp. For. Inst., Oxon., ♀ fruiting calyx) : tree 4·5–6 m. high and approximately 17·5 cm. in diameter at breast-height, growing on a granite-boulder hill. Umtali District : Umtali, 23 June 1938, *Communicavit G. M. McGregor* W. 16/38 (Herb. Imp. For. Inst., Oxon., barren) :—tree 12 m. high. Victoria District : Victoria *C. F. H. Monro* 804 (Herb. Kew., barren). District uncertain : no locality, 1370 m., Sept. 1911, *H. G. Mundy* 1095 (Herb. Kew., barren). Satsi River, 26 Sept. 1936, *G. M. McGregor* M.117/37 (Herb. Imp. For. Inst., Oxon., barren).

Although without doubt a very close relative of *D. Dawei*, the new species has a decidedly different facies, and the constancy of the foliage characters seems attested by the rather ample material available.

The species is described as a *Diospyros*, although belonging to what has been hitherto regarded in Africa as the distinct genus, *Maba* J. R. et G. Forst. In view of the inconstancy of the characters, it seems that the species of *Maba* must be ultimately incorporated into *Diospyros*, as has already been done for the Malayan species, see Bakhuisen van den Brink, in Gard. Bull, Straits Settlements, **7,** 161 *sqq.* (1933).

The only specimen of the new species bearing ♂ flowers has lost all but a few, and the very slight variation in measurements noted between the ♂ and ♀ flowers is probably attributable merely to the limited range of the former available. The constant trimery observed in the ♀ corollas is perhaps another matter.

ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW : XX.*

(Edited by H. K. Airy Shaw.)

"The Wild Fauna and Flora of the Royal Botanic Gardens, Kew," was published as volume **5** of the *Additional Series* of the *Bulletin* in 1906, followed by a series of Supplements of which the last was published in 1938. Though it was numbered "XVIII," it was actually the nineteenth, since two consecutive supplements (the fifteenth and sixteenth) were by an oversight both numbered "XV," and the seventeeth, eighteenth and nineteenth were numbered "XVI," "XVII" and "XVIII" respectively. The present supplement is therefore numbered "XX". With the recommencement of the *Kew Bulletin* after the second world war, it seems appropriate to present a summary of, and a brief index to, the contents of the supplements so far issued.

The Wild Fauna & Flora of the Royal Botanic Gardens, Kew. *Bull. Misc. Inf.* ("*K.B.*"), *Add. Ser.* **5** ; pp. vii +223, with plate (1906). (See *K.B.* **1906,** 42–44).

Supplements. Summary of contents.

[I.] "New & Additional Species of Fungi occurring in the R.B.G., Kew." [G. Massee]. *K.B.* **1906,** 46–7, with plate.

II. Hemiptera—Homoptera : Coccidae (R. Newstead). *K.B.* **1907,** 97–100.

III. Lepidoptera (A. Langley Simmons). *K.B.* **1907,** 156–187, with plate.

IV. "New and Additional Species of Fungi : Second Series" (G. Massee). *K.B.* **1907,** 238–244, with plate.

V. Mollusca (Alfred Sich). *K.B.* **1907,** 282–3.

VI. Insecta (Orth., Neur., Hym., Col.) (W. J. Lucas) ; Tropical Cockroaches (W. Watson). *K.B.* **1907,** 401–3, with plate.

VII. i. Fauna : Coleoptera (H. St. J. Donisthorpe) ; Hymenoptera-Formicidae (ditto) ; Hemiptera-Homoptera-Aphidae & Coccidae (R. Newstead). ii. Flora : Phanerogams & Muscineae (A. B. Jackson). *K.B.* **1908,** 120–127.

VIII. i. Macro-Lepidoptera (with Tortricina) (A. Langley Simmons). ii. Micro-Lepidoptera (Alfred Sich). *K.B.* **1908,** 272–283.

IX. Nematoda [anon.] ; Terrestrial Isopod Crustacea (Richard S. Bagnall) ; Arachnida (Rev. O. Pickard-Cambridge) ; Hymenoptera (H. St. J. Donisthorpe) ; Coleoptera (W. E. Sharp) ; Thysanoptera (Richard S. Bagnall) ; Pisces [anon.]. *K.B.* **1909,** 243–256, with plate [ants and spider].

X. Phanerogams : Rubi (R. A. Rolfe & A. B. Jackson) ; Fungi : Third Series (G. Massee). *K.B.* **1909,** 369–376.

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*Continued from *Bull. Misc. Inf.*, **1938,** 396 (1938).

XI. Annelida (Rev. Hilderic Friend) ; Coleoptera (W. E. Sharp). *K.B.* **1910,** 79–84.

XII. Aves ; Reptilia ; Mollusca ; Arthropoda-Malacostraca ; Antennata-Myriapoda ; Insecta—Thysanura, Collembola, Diptera [all anon.] ; Coleoptera (W. E. Sharp) ; Hymenoptera (H. St. J. Donisthorpe) ; Arachnida (Rev. O. Pickard-Cambridge) ; Annelida-Oligochaeta (Rev. Hilderic Friend). Flora: Rosaceae (R. A. Rolfe), etc. ; Algae (anon., A. D. Cotton, L. A. Boodle) ; Fungi : Fourth Series (G. Massee). *K.B.* **1911,** 365–377.

XIII. [Fungi :] Chaetomium (and Ceratostoma) (G. Massee). *K.B.* **1912,** 161–166, with plate.

XIV. [Fungi :] Agaricaceae, Polyporaceae, Thelephoraceae, Sphaeriaceae, Pezizaceae, Melanconiaceae, Hyphomycetaceae (G. Massee) *K.B.* **1913,** 195–199, with plate.

XV. Coccidae (E. Ernest Green). *K.B.* **1917,** 73–76.

XVI. [" XV "]. Fauna : Coleoptera [anon.], Hemiptera-Aphididae (F. Laing), Aleurodidae (do.), Psyllidae (do.), Coccidae (E. E. Green) ; Nematoda (H. A. Baylis). Flora : Phan., Hepaticae, Fungi [anon.]. *K.B.* **1920,** 212–217.

XVII. [" XVI "]. " Bark Beetles (Coleoptera)." (W. Dallimore and J. W. Munro). *K.B.* **1922,** 189–193, with figure.

XVIII. [" XVII "]. Mammals, Birds (largely H. N. Ridley & C. J. Robinson), Insects (Col., Hym., Dipt. [H. A. Latham], Lep.), Arachnida, Annelida ; Flowering Plants, Algae, Fungi (Pyrenom., mostly G. W. Mason), Mycetozoa (Mrs. V. G. Wiltshire). *K.B.* **1936,** 60–66.

XIX. [" XVIII "]. " The Ants of the Royal Botanic Gardens, Kew " (I Introduced ; II Indigenous) (A. Norman Brangham) *K.B.* **1938,** 390–396.

Subject-index to above summary of contents (supplements only).

(Supplements XVI—XIX are cited by their true numbers, not by the erroneous numbers actually prefixed).

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Miscellaneous Records, 1945–46

In the following notes, species known to be introduced are marked with an asterisk (*). A few species have been included from localities just outside the precincts of the Gardens proper (*e.g.*, from Kew Green); these are placed in square brackets []. References to previously published records of species are also given in square brackets: the original *Wild Fauna and Flora* (1906) is indicated by the letter "F," and the succeeding Supplements by their appropriate true Roman number, followed in each case by the page number (in arabic), *e.g.*, F.26, III.159, etc. "*Ent. Mon. Mag.*" signifies the *Entomologist's Monthly Magazine*.

Unless otherwise stated, all records and determinations are by the compiler (H.K.A.S.).

FUNGI

R. W. G. Dennis

Discomycetes

Sclerotinia mespili *Schellenb.* Stat. conid. on medlar leaves, Rosaceae collection, 30.v.45, *R.W.G.D.*

Hyphomycetes

Helminthosporium tritici-repentis *Died.* On *Agropyrum repens*, 24.v.45, *R.W.G.D.*

H. dictyoides *Drechsl.* On *Lolium*, 4.v.45, *R.W.G.D.*

H. stenacrum *Drechsl.* On *Agrostis*, 15.vi.45, *R.W.G.D.*

H. vagans *Drechsl.* On *Poa pratensis* near Aroid House, 25.v.45, *R.W.G.D.*

Basidiomycetes

Boletus variegatus (*Schwartz*) *Fr.* In chink of wall, 2 courses from top, behind plant of *Diospyros kaki* near entrance to Melon Yard, 12.ix.46,

H. K. Airy Shaw. A curious habitat for this heath and pine-wood species, which has not hitherto been recorded from the Gardens.

Lepiota denudata *Rabh.* Tropical Pits, xi.46, *E. M. Wakefield.*

Polyporus kymatodes *Rostk.* On larch, Arboretum, 1946, *E. M. Wakefield.*

MYCETOZOA

R. W. G. Dennis

PHYSARACEAE

***Physarum echinosporum** *Lister.* On compost in a pot in which Aroid seeds from Kenya had been sown, 10.ix.46, *W. J. Slade.* Previously known only from the type locality—Antigua.

INSECTA

HEMIPTERA—HETEROPTERA

No records of this important group have hitherto been published.

LYGAEIDAE

Heterogaster urticae *F.* A single specimen on window in Herbarium, 15.x.45.

MIRIDAE

Lygus campestris *L.* On *Heracleum* by Herbarium, 1.viii.46.

Blepharidopterus angulatus *Fall.* Probably this, seen flying round and alighting on flowers of *Hedera helix* var. *arborescens* by Succulent House, 27.ix.46. [One to light, 11.30 p.m., 13 Lichfield Rd., 1.x.46.]

Capsus (Heterotoma) meriopterus *Scop.* Nymphs on *Solanum dulcamara*, Herbarium Experimental Ground, 2.vii.46.

HEMIPTERA—HOMOPTERA

No records of *Cicadoidea* (frog-hoppers, cuckoo-spit, etc.) have so far appeared in this series.

TETTIGONIELLIDAE

***Graphocephala coccinea** *Forst.* Swarming on Rhododendrons, 10.x.46, *H. A. Terry.* This beautiful green and carmine species, a native of North America, was first recorded in this country from Chobham, in 1935 ; see *Ent. Mon. Mag.* **71**, 277–9 (1935). It has since been found at Wimbledon, Surrey, and near Slough, Bucks. I am much indebted to Mr. Terry, of the Muséum d'Histoire Naturelle, Paris, at present working at the Zoological Gardens, Regent's Park, for drawing my attention to its presence in the Royal Botanic Gardens.—See coloured figure in *Ent. Mon. Mag.* 84, tab. C, fig. 5 (1948).

APHIDIDAE

Aphis (Doralis) hederae *Kaltenb.* On ivy shoots outside top floor of Wing C, Herbarium, 5.xii.45 ; *det.* F. Laing, British Museum. It seemed curious to find this aphid apparently multiplying vigorously on an exposed east wall in mid-winter, though no doubt the warmth from the central heating had some effect on it. In spite of the late date, Mr. Laing

was unable to discover any sexual forms in the material which I sent him. [XVI.213].

ALEURODIDAE

Aleuroplatus kewemsis *Trehan.* See Trehan, 'Two new species of Aleurodidae found on ferns in greenhouses in Britain', *Proc. Roy. Ent. Soc.* B, **7** (9) : 182–189 (1938).

Trialeurodes williamsi *Trehan.* See Trehan, l.c.

LEPIDOPTERA

SPHINGIDAE

[**Macroglossum stellatarum** *L.* One observed flying high up along wall of row of shops at corner of Mortlake Rd., 7.viii.46, *I. S. Menzies & H.K.A.S.*] [III.159].

CARADRINIDAE (Agrotidae, Noctuidae)

Diataraxia oleracea *L.*, the "Bright-line Brown-eye." Several larvae of what was almost certainly this species almost completely defoliated a plant of *Menyanthes trifoliata* in the water-garden, 20.ix.46. I am indebted to Messrs. B. A. Cooper and Austin Richardson for the suggested identification of the larvae from my description. The species has apparently not previously been recorded from the Gardens.

YPONOMEUTIDAE

Scythropia crataegella *L.* Larvae on *Cotoneaster horizontalis* outside Herbarium, v.46 (and old webs seen, 28.ix.45). [Airy Shaw in *Ent. Mon. Mag.* **82,** 154 (1946).] See article on this and other pests of *Cotoneaster*, by G. Fox Wilson, in *Journ. Roy. Hort. Soc.* **70** (9), 271–5 (1945).

COLEOPTERA

STAPHYLINIDAE

[**Staphylinus stercorarius** *Oliv.* Two running over path across Kew Green, 9 & 10.ix.46 (one on each day).]

SILPHIDAE

[**Thanatophilus** sp. (specimen not taken). On path over Kew Green, 27.ix.46.]

LUCANIDAE

[**Lucanus cervus** *L.* A male on pavement by bus stop, Kew Green, 30.vi.46.] [F.26.]

SCARABAEIDAE

Gnorimus nobilis *L.* One feeding at flowers of *Heracleum persicum* Desf. in Herbarium Experimental Ground, 1.vii.46, *E. Milne-Redhead & H.K.A.S.* [F.222 ; Airy Shaw in *Ent. Mon. Mag.* **83,** 22 (1947).]

[**Aphodius contaminatus** *Herbst.* Abundant on "dog-walk" over Kew Green, 9.ix.46, and on many other occasions. The beetles seem fond of "patrolling" the path, flying up and down it about six inches above the ground, and soon congregating at any fresh deposit. No other species of *Aphodius* has so far been observed there.]

CLERIDAE

Necrobia rufipes *De G.* One on "gone-over" head of *Heracleum persicum* Desf. in Herbarium Experimental Ground, 1.vii.46, *E. Milne-Redhead & H.K.A.S.* [VII.121.]

NITIDULIDAE

Laria (Pria) dulcamarae *Scop.* Shaken from flowers of *Solanum dulcamara*, Herbarium Experimental Ground, 2.vii.46, *E. Milne-Redhead.*

LATHRIDIIDAE

Cartodere filum *Aubé.* One found alive in dried Indian plant-specimens in Herbarium, 1.i.47. [*Ent. Mon. Mag.* **83** 115 (1947).] This may possibly have been the species referred to by H. H. W. Pearson [F.26] as "*Cartodere* sp. Found among dried specimens of Chinese plants." It is a minute but distinct species, and usually a rarity in this country, where it has apparently occurred almost exclusively in herbaria. A specimen was found recently in a tea-dealer's sale-room in the Minories, E.C.3 ; see *Ent. Mon. Mag.* **83** (1), 12 (1947).

ANOBIIDAE

Stegobium paniceum L., the "drugstore beetle." Occasionally found in specimens in the Herbarium.

PTINIDAE

Niptus hololeucus *Falderm.* Occasional in Herbarium specimens. The frass is very distinctive, consisting apparently of continuous threads of excrement.

CHRYSOMELIDAE

Zeugophora subspinosa *F.* A few specimens on undersides of leaves of poplar (*Populus trichocarpa* Torr. et Gray) by old bowling green near tennis courts, 21.viii.46, and subsequently. The beetles drop at the least sign of danger, and also quite readily take to the wing. The evidence of their feeding is scattered small holes in the lower mesophyll; they apparently do not eat out large areas.

Chalcoides aurata *Marsh.* Two on poplar by bowling green, 2.ix.46, *I. S. Menzies.*

PLATYSTOMIDAE (Anthribidae)

***Araeocerus fasciculatus** *De G.* A single specimen emerged from a palm fruit (*Raphia* sp.) received from Natal, 3.iv.46, *E. Milne-Redhead.* [F.27.]

DIPTERA

SYRPHIDAE

Volucella zonaria *Poda.* Two or three of these magnificent flies were seen feeding on ivy bloom (*Hedera helix* var. *arborescens*) near the Succulent House on most days from 11.ix.46 until well into October. The species is a migrant, and has been seen in this country in increasing numbers in recent years. Reports of its occurrence in southern England were very numerous in 1946. It undoubtedly establishes itself and breeds in this country when conditions are favourable, but cannot survive a severe winter. The larvae live in the nests of hornets and wasps, whose

brood they devour ; they have more than once been found in this country. The colouring of the adult fly is very similar to that of the hornet, for which no doubt it is sometimes mistaken by the uninitiated !

Volucella inanis *L.* One specimen, almost certainly this, seen on the above ivy bloom, with *V. zonaria*, 19.ix.46. Closely related to the preceding species, but not quite so handsome.

MOLLUSCA

TESTACELLIDAE

Testacella scutulum *G. B. Sowerby.* In greenhouse of Herbarium Experimental Ground, 16.ix.46, *R. A. Blakelock.* [F.13].

STENOGYRIDAE

Cochlicopa lubrica (*Müller*), var. **ovata** *Jeffr.* Many on outer wall of air-raid shelter, Wing A, Herbarium, 1.x.46, *E. Milne-Redhead.* [Cf. F.13].

AVES

FRINGILLIDAE

Coccothraustes c. coccothraustes *L.*—What was almost certainly a hen hawfinch was seen on a small tree close to the new wing of the Herbarium, 3.ii.47. (*B. L. Burtt* and others). Unfortunately it was not possible to obtain a satisfactory view of it before it flew away. [F.6].

LARIDAE

Larus fuscus graellsii *Brehm.*—A lesser black-backed gull was seen on the central " fountain " in the Pond on several occasions during the winter of 1946–7 (*E. Milne-Redhead*). The species has not previously been recorded from the Gardens.

Invertebrata collected in the plant-houses in April 1946 by Dr. A. D. J. Meeuse (Holland).

On 16th April, 1946, I had the pleasure of taking Dr. A. D. J. Meeuse, who was on a short visit to this country, round some of the houses in the Gardens for the purposes of investigating, and making a collection of, the introduced fauna—a subject in which he is especially interested. We visited the Palm House, the T-Range, the Ferneries and the Aroid House, and obtained a varied assortment of " captures ", concentrating mainly on the Mollusca, Crustacea and ants.

Dr. Meeuse, and his friends Dr. L. B. Holthuis* and Mr. L. van der Hammen, both of the Leiden Museum, have now examined the Mollusca, Crustacea (Isopoda)*, and Arachnida, respectively, and have most kindly furnished the accounts of these groups which follow. It is hoped that Dr. S. J. van Ooststroom may be able to deal with the ants shortly. We are greatly indebted to our Dutch friends for the trouble they have taken in preparing these interesting reports, and hope (as they do) that they will be able in the near future to undertake yet further investigations

*Dr. Holthuis's account of the Isopoda summarises all the forms hitherto recorded from Kew by previous workers, as well as those included in his own detailed paper on Dr. Meeuse's material, published in the *Ann. & Mag. Nat. Hist.* (with description of the new species *Chaetophiloscia meeusei*).

into the introduced fauna of the Kew Plant-houses. When it is considered that, in the course of a single afternoon's collecting, several additions to the Kew list, one or two new records for Britain, and at least one species new to science (the small woodlouse, *Chaetophiloscia meeusei* Holthuis), were discovered, it is evident that the fauna of the tropical houses at Kew presents a very profitable field for investigation.—H. K. Airy Shaw.

Mollusca

by A. D. J. Meeuse, Ph.D. (The Hague, Holland)

Very little has been published on the Mollusc fauna of the hothouses of Kew Gardens, viz. a paper by Brindley in *Bull. Misc Inf., Addit. Series*, **5**, 12–14 (1906), and a supplement to that paper in *Bull. Misc. Inf.* **1911**, 365 (1911). Brindley did not distinguish between the species collected in the open and those collected in the hothouses, but judging from his list the following species at least were living in the hothouses at that time :

"**Stenogyra goodallii** *Mill.*" (=**Opeas pumilum** (*Pfr.*))

Subulina octona *Chemn.*

Physa acuta *Drap.*

In supplement XII (1911) a further species, viz. **Hyalinia lucida** *Drap.* (=**Oxychilus draparnaldi** (*Beck*)), is recorded from the hothouses.

I collected the following species :

Physa acuta *Drap.* Victoria Regia House, 16.iv.1946, 2 specimens. Known from the hothouses at Kew since 1860. A Mediterranean species, introduced in many hothouses elsewhere in Europe.

Subulina octona (*Gmel.*). Very numerous, found in most houses. Recorded from Kew as early as 1884. Widely distributed in the tropics and occurring as an introduction in hothouses in Europe (e.g. Berlin, Copenhagen).

Opeas pumilum (*Pfr.*). Fern House, a single adult specimen 16.iv.1946. Mentioned by Brindley (1905) as "*Stenogyra goodallii.*" Widely distributed in the tropics and introduced in many hothouses in Europe and the United States.

Opeas clavulinum (*Pot. & Mich.*). Fern House, 16 adult and young specimens, 16.iv.1946. This species was described from Réunion, but has since spread all over the tropics. It has previously been recorded from a hothouse in Nottingham, England, in 1916. This is a new record for Kew Gardens.

Zonitoides arboreus (*Say*). Fern House, 16.iv.1946, 8 adult and young specimens. This North American species has been recorded from various places in Ireland and on the continent. This is a new record for Kew and for Britain.

Oxychilus draparnaldi (*Beck*). Aroid House, one empty shell, 16.iv.1946. This species was recorded from Kew in 1911 as "*Hyalinia lucida* Drap." It occurs in many hothouses in Europe.

Deroceras laeve sandwichiense (*Eyd. & Souleyet*). Palm House, 16.iv.1946, a single juvenile specimen under a wooden case used to rear seedlings of a gramineous plant. This record, which is new to Britain, is given with some diffidence, because this species can only be recognised by anatomical characters which are lacking in juvenile specimens. I have seen a great many living specimens of this species, both adult and young ones, so that I am convinced I can recognise them by their peculiar slatish-purple colour, which is not found in any other species of slug reported from hothouses. Still, there may exist other tropical species showing the same character. It is to be hoped, therefore, that adult specimens will be found to confirm this record.

Deroceras laeve sanwichiense has been found in the tropics and in several hothouses in Europe (Germany, Holland, and probably Ireland). An interesting account of the species has been published by Boettger in *Arch. Zool. Ital.* **16** (1931), p. 250–283, to which reference should be made for further details.

Terrestrial Isopod Crustacea

by Dr. L. B. Holthuis

(Rijksmuseum van Natuurlijke Historie, Leiden, Holland)

The terrestrial Isopod Crustacea found in the gardens and the houses of the Royal Botanical Gardens at Kew have already been dealt with in the papers by Scourfield (1906) and Bagnall (1909), while Budde-Lund (1912) also recorded a species from Kew Gardens. The present list is partly compiled from literature and partly based on material collected in April, 1946, by Dr. A. D. J. Meeuse. A more extensive report on the material collected by Dr. Meeuse appeared in the *Annals and Magazine of Natural History*, ser. 11, **13** (98), 122–137 (Dec. 1946).

The first list of Isopoda from Kew Gardens, compiled by Scourfield (1906), contained 5 species (Scourfield moreover mentioned the aquatic Isopod *Asellus aquaticus* (L.) from the Lake) ; the second, by Bagnall (1909), 18 species, 2 of which were identified as to the genus only. At present 20 species are known from Kew Gardens. For literature I refer to my paper in the *Annals and Magazine.*

Trichoniscidae

Trichoniscus pusillus *Brdt.* Recorded by Bagnall (1909). It is not known if Bagnall's specimens were collected in the greenhouses or in the open gardens.

Trichoniscus pygmaeus *G. O. Sars.* Bagnall mentions this species as " not uncommon in the cooler houses and in the open gardens." Dr. Meeuse collected one specimen in the greenhouses.

Androniscus dentiger *Verhoeff.* 56 specimens of this species were collected by Dr. Meeuse, who reported that it is abundant in most of the houses. Bagnall (1909) does not mention this species, but possibly the specimens referred to by him as *Trichoniscus roseus* Koch (which species is at

present placed in the genus *Androniscus*) in reality belong here. The differences between *Androniscus roseus* and *A. dentiger* are very small and the latter species was separated from the former as late as 1908. Bagnall reports his specimens from " the houses and the pits, and occasionally in the open."

[**Androniscus roseus** (*Koch*). As pointed out above, the specimens referred to this species by Bagnall may belong to *Androniscus dentiger*. The species is also mentioned by Scourfield (1906).]

Cordioniscus stebbingi (*Patience*). Bagnall reports this species as *Trichoniscus stebbingi* from " the roots of plants in the hotter propagating pits." It was not found by Dr. Meeuse.

Miktoniscus linearis (*Patience*). Recorded by Bagnall under the name of *Trichoniscus linearis* from the cooler houses. It is only known from greenhouses, and was described as a new species from material collected at Kew Gardens.

Trichoniscoides albidus (*B.-L.*). This species was found by Bagnall " under a board in a cool frame." It is quite possible that Bagnall's specimens do not belong to the typical *T. albidus*, as, since the publication of his paper in 1909, numerous allied species have been described.

Haplophthalmus mengei *Zaddach*. Bagnall mentions a single specimen from a propagating house.

Haplophthalmus danicus *B.-L.* Recorded by Bagnall from the cooler propagating houses and from the open gardens.

Oniscidae

Oniscus asellus *L.* Mentioned in the papers by Scourfield (1906) and Bagnall (1909). Dr. Meeuse collected several specimens in the greenhouses.

Philoscia muscorum (*Scop.*). Recorded by Scourfield (1906) and Bagnall (1909) from Kew Gardens. It is not indicated by Bagnall whether the species was found in the open Gardens or in the greenhouses. The species is common in W. Europe in the open, but has not been recorded from greenhouses.

Philoscia patiencei *Bagnall*. This species, which is recorded by Bagnall from the hottest propagating houses, certainly does not belong to the genus *Philoscia* s.s.. It may be a species of *Chaetophiloscia*, but as I have no material at my disposal I can give no definite opinion on this question. As far as I know the species has only been recorded from Kew Gardens.

Chaetophiloscia meeusei *Holthuis* (*Ann. & Mag. Nat. Hist.* . . . . . .) 13 specimens of this species were collected by Dr. Meeuse in the greenhouses, mostly under stones in the Victoria house. When the stones were lifted and turned upside down the animals on it remained quiet, but they ran away very fast when disturbed. They probably are the same form as the animals mentioned by Bagnall (1909, p. 245) as *Philoscia* sp. Bagnall's specimens were found " deep down in the wet shingle, in the Palm, Fern and Economic Houses ".

PORCELLIONIDAE

Trichorina tomentosa (*B.-L.*). Budde-Lund (1912) mentions this species from Kew Gardens. It is perhaps the same species as that indicated by Bagnall (1909, p. 246) as *Bathytropa* sp., from one of the hottest propagating houses. The genus *Trichorina* was separated from *Bathytropa* as late as 1908. The species is also recorded from greenhouses in Belfast, while from greenhouses on the continent specimens of *Trichorina thermophila* (Dollf.) (Paris and Hamburg) and *T. monocellata* Meinertz (Utrecht, Copenhagen and Berlin) are known. The relation between these three species is still very obscure.

Porcellionides pruinosus (*Brdt.*). Mentioned by Bagnall as *Metoponorthus pruinosus* (Brdt.) from the open gardens, the cooler houses and the Tropical Fern House. Dr. Meeuse collected specimens of this species in the Victoria regia House and propagating pits nearby.

Porcellio scaber *Latr.* This species is mentioned by Scourfield and Bagnall. The latter does not indicate whether the species was found in the open gardens or in the greenhouses.

Porcellio dilatatus *Brdt.* Found by Bagnall to be " not uncommon in most of the pits and in a heap of vegetable refuse in the open."

Porcellio sp. Bagnall mentions under *Porcellio* spec. a species, which he thinks is probably referable to " *Nagurus cristatus*, B.-L.". The name *Nagurus cristatus* is in all probability a mis-spelling of **Nagara cristata** (Dollfus) B.-L., a species which has also been observed in hothouses in Holland.

ARMADILLIDIIDAE

Armadillidium vulgare (*Latr.*). This species was recorded from Kew Gardens by Scourfield (1906). Bagnall failed to find it, but Dr. Meeuse collected some specimens in a propagating house and stated that it was rather abundant in several houses.

Armadillidium nasutum *B.-L.* A very common species in greenhouses all over Europe and also recorded from North America. It was found by Bagnall in the Palm and Economic houses and in the propagating pits ; it lives amongst shingle and at the roots of plants. Dr. Meeuse also collected specimens of this species and noted them to be very common in most houses.

Reductoniscus costulatus *Kesselyák.* This very small species, which is only slightly more than 2 mm. long, was found by Dr. Meeuse in the *Victoria regia* House, the specimens being especially abundant under bricks. According to Dr. Meeuse, the animals do not move appreciably. Though small, they are conspicuous by their shape (" like a tortoise shell ") and by the ridges across their backs.

The species has not hitherto been recorded from England, in fact this curious form was only known from the greenhouses of the Botanical Gardens in Berlin, where it was found in 1930, while a second species of the genus, *R. fritschii* Verh., which closely resembles the present form, was found in 1937 in the Berlin Aquarium. These two curious species are the only known representatives of the genus, for which a new subfamily *Reductoniscinae* was made by Verhoeff in 1937.

Note on the Arachnida

by L. van der Hammen

(Rijksmuseum van Natuurlijke Historie, Leiden, Holland)

Pedipalpi

Trithyreus bagnalli Jackson, 1907, *Trans. Nat. Hist. Soc. Northumb.*, (N.S.), 3 (1), p. 29 (sep.) ; 1909, *ibid.* 3 (2), p. 23 (sep.), pl. 10, fig. 1–5.

1 female under a brick in the Victoria regia house, Kew, 16th April, 1946, leg. *A. D. J. Meeuse.*

This species was described from Kew, where it was found in 1907. Other localities are unknown.

The colour of our specimen is not dark brown as in the original description, but light greenish brown.

Measurements : total length (without flagellum) 3 mm. Flagellum : length 0·17 mm. ; width 0·07 mm. (Jackson wrote in error : length 2 mm., width 0·5 mm., instead of 0·2 and 0·05). Femur IV : length 0·90 mm., width 0·47 mm.

Araneae

Hasarius adansoni (*Audouin*)

Hasarius adansoni, Simon, 1937, *Les Arachnides de France*, 6 (5), pp. 1243, 1271, figs. 2025, 2026.

1 male, 1 female, 2 juv., in the Fern House and elsewhere, Kew, April 16th, 1946, leg. *A. D. J. Meeuse.*

This circumtropical species is common in European hothouses. It has been recorded from Kew several times.

Plant Names Simplified.*—The appearance of a second edition of this little book will be welcomed by all those interested in the pronunciation, definition and derivation of botanical names. The scope of the work has been increased by the inclusion of additional genera and species and the new sectional genera of cacti, mesembryanthemums and houseleeks. Names are alphabetically arranged in a clear and concise manner, thus facilitating easy reference and adding to the general usefulness of the book for horticulturists and others taking an interest in garden and greenhouse plants. The book is not without errors and unfortunately some of the definitions and derivations given are of doubtful accuracy. For instance the generic name *Thladiantha* is derived from the Greek word meaning eunuch, not " compressed," in reference to the occurrence of neuter flowers (see Gard. Chron., ser. 3, **106** : 328, 1939), while the specific epithet *dubia* surely should be interpreted as ' dubious,' ' doubtful,' or ' uncertain.'

H.S.M.

*By A. T. Johnson and H. A. Smith. W. H. & L. Collingridge Ltd., London (second edition), 1947. Price 7/6.

NEW SPECIES OF NOTOTRICHE.

B. L. Burtt and A. W. Hill.

At the time of his death in 1941 Sir Arthur Hill was working on a new account of the genus *Nototriche* Turcz. (*Malvaceae*), of which he had published a revision some 30 years earlier (see Trans. Linn. Soc. 2nd ser. Bot. **7**, pt. 12 : 1909). I had been helping him in this study for some time, but my own share of the work was interrupted in 1940. It is not possible to proceed at present with the proposed account of all the species of this intricate genus, but it seems desirable to publish without further delay the new species which have so far been recognized. Those appearing below with our joint names were all designated and described before Sir Arthur's death and only minor alterations have been made : those bearing only Hill's name were studied during my absence and the descriptions are from his manuscript notes.

In one case the accession of further material has indicated that a plant we had tentatively regarded as a new species can only be accorded varietal rank : for this I have taken full responsibility.

Throughout the work the services of Miss Ross-Craig have frequently been called upon for careful examination and illustration, but it is unfortunately impossible to publish in the present paper all the figures that have been prepared. Acknowledgements are also due to the Directors of the various institutions who have so kindly lent material for examination, and to the collectors themselves, especially to Miss D. Stafford whose Peruvian specimens have not only provided several of the novelties now described, but have also greatly increased our knowledge of the older species.

Previous additions to the genus *Nototriche*, published by Sir Arthur Hill since his original revision of the genus, appeared in Kew Bull. 1927, 248 ; 1928, 17 ; 1932, 77 ; 1933, 485 ; 1935, 160.

B. L. Burtt.

Nototriche castillonii *B. L. Burtt et A. W. Hill.* sp. nov. ex affinitate *N. glaucae* A. W. Hill a qua folii segmentis multilobulatis, carpellis vix rostratis facile distinguitur. (Fig. 1).

Planta, una sola adhuc visa, caudice 7 mm. diametro apice bifurcato foliorum rosula circiter 6 cm. diametro coronato. *Folia* circiter 4–5 cm. longa ; stipulae parte libera lineari 5–6·5 mm. longa, basi petiolo adnatae et cum eo vaginam 6–9 mm. longam formantes ; petiolus parte libera 4·5– 6 mm. longus ; petiolus stipulaeque molliter stellato-pubescentia. *Lamina* 1·75–2·25 cm. longa, ambitu ovata vel late elliptica, lobis primariis 3 vel 5 iterum lobatis et lobulatis, lobulis obtusis crispis, utrinque dense breviter molliter stellato-tomentosa. *Flores* subsessiles, in petiolo inter stipulas producti. *Calyx* circiter 1 cm. longus, lobis 5 triangularibus 5 mm. longis, extra et intra lobos ut folium breviter stellato-tomentosus. *Corolla* circiter 2 cm. longa ; petala basi in tubum 2–3 mm. longum connata, obovato-cuneata, circiter 1·6–1·8 cm. longa et 8 mm. lata, basi pilis simplicibus unicellularibus instructa. *Tubus stamineus* 12 mm. longus, glaber ; antherae in caput globosum 2·5 mm.

Fig. I. *Nototriche castillonii* B. L. Burtt et A. W. Hill. 1, sterile leaf, × 1·5 ; 2, fertile leaf, × 1·5 ; 3, hairs from leaf, × 30 ; 4, corolla, × 1·5 ; 5, fruiting carpel, × 3 ; 6, seed, × 3.

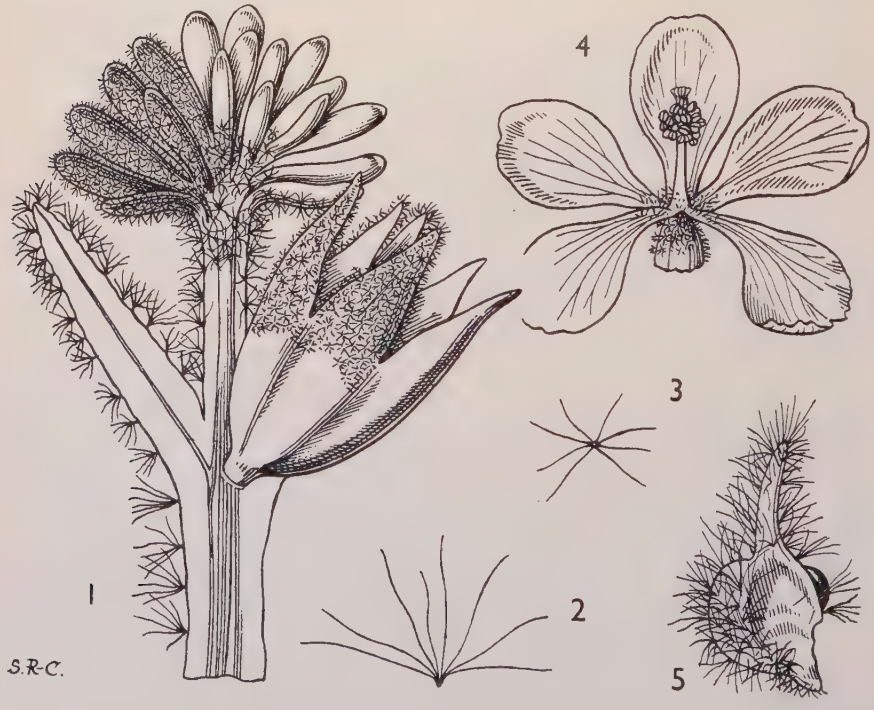

Fig. II. *Nototriche digitulifolia* A. W. Hill. 1, fertile leaf, × 4 ; 2, hair from stipule, × 16 ; 3, hair from lamina, × 16 ; 4, corolla, × 2 ; 5, fruiting carpel, × 6.

diametro congestae. *Styli* 20. *Carpella* brevissime et obtuse rostrata, dorso dense et longe sericea.

Argentina. Prov. Jujuy, est volcan, Feb. 1920, *Castillon* 7185 (ex herb. inst. Lillo).

Nototriche digitulifolia *A. W. Hill*, sp. nov. *N. pedatilobae* A. W. Hill affinis, sed stipulis angustioribus, folii segmentis digituliformibus, calycis lobis longioribus, corollae tubo breviore facile distinguenda. (Fig. II).

Fruticulus depressus, caespitosus ; pulvilli 2–4 cm. lati ; caudex subterraneus ultra 15 cm. longus, lignosus. *Folia* dense in pulvillis aggregata pilis albis interexta ; petiolus 1·2 cm. longus ; stipulae ad medium petiolum adnatae et cum eo vaginam membranaceam formantes, parte libera 8–9 mm. longa lineari-lanceolata, vaginae facie glabra dorso et ad margines longe stellato-tomentosa ; petiolus supra stipulis omnino pilis longis stellatis vestita ; lobulae 7 in segmentis digituliformibus spathulatis erectis ad basin dissectae, 1·3–5 mm. longae. *Flores* ad petiolum medium insidentes. *Calyx* 1 cm. longus, ad medium 5-lobus, lobis viridibus anguste triangularibus acutis dorso et ad margines pilis strigoso-stellatis instructis, tubo glabro. *Corolla* tubo 3 mm. longo extra stellato-piloso, lobis obovatis 12 mm. longis 7 mm. latis. *Stamina* tubo a corolla libero 6 mm. longo ; antheris c. 25 in caput globosum dispositis. *Carpella* 6 mm. longa, birostrata, rostris 2·75 mm. longis densestellato-tomentosis. *Semina* reniformia 2·5 mm. longa, dorso sulcata, rugosa.

Peru. Puno, San Antonio de Esquilache, on sandy soil, 4500 m., 24 May 1937, *Miss D. Stafford* 765.

Nototriche erinacea *A. W. Hill*, sp. nov. *N. sulphureae* A. W. Hill similis sed foliis minoribus, pilis crassioribus, floribus minoribus, calcye pilis longe stipitatis instructo, corollae tubo longiore, petalis basi haud tomentosis, carpellis longe rostratis differt. (Fig. III).

Fig. III. *Nototriche erinacea* A. W. Hill. 1, fertile leaf, nat. size ; 2, part of upper surface of leaf, × 4 ; 3 & 4, hairs from leaf, × 30 ; 5, part of calyx, inner surface, × 2 ; 6, corolla, × 2 ; 7, fruiting carpel, × 2.

Caudex lignosus, crassus, parce ramosus, rosula 10 cm. usque diametro coronatus. *Folia* usque ad 7 cm. longa, ubique dense stellato-tomentosum, indumento (saltem siccitate) flavescente ; petiolo 3–4 cm. longi ; stipulae parte libera lineari acuta 1·5 cm. longa, basi petiolo adnatae et cum eo vaginam 2·3 cm. longam utrinque uti parte libera pilis stellatis praeditam formantes ; *lamina* ambitu ovato-lanceolata, 2·5–3 cm. longa et 2 cm. lata, bipinnatifida segmentis primariis utrinque 5, segmento medio elongato 2–2·8 cm. longo bipinnatifido lobulis crenatis, lobulis terminalibus rotundatis lateralibus plus minusve oblongis acutis. *Flores* in petiolo inter stipulas subsessiles. *Calyx* 1·7 cm. longus, tubo 7 mm. longo, lobis 1 cm. longis anguste triangularibus, extra uti folium dense stellato-tomentosus, lobis intus pilis strigosis appressis instructis. *Corolla* tubo 3 mm. longo parce pubescente vel glabro, petalis anguste obovatis 11 mm. longis et 6 mm. latis. *Tubus staminеus* 6 mm. longus, glaber ; antherae flavae in caput globosum congestae. *Carpella* 1 cm. longa birostrata, rostris 5 mm. longis dorso pilis sericeis 5 mm. longis instructis.

Peru. Dept. Puno : San Antonio de Esquilache, 4500–4800 m., stony slopes below highest ridges of rocks, flower violet, grey-green leaf, 17 May 1937, *Miss D. Stafford* 758.

Some of the hairs on the calyx are on long green stout stalks standing above the general level of the shorter hairs ; minute glandular hairs are also present.

Nototriche estipulata *A. W. Hill* sp. nov. adhuc cum *N. famatinensi* confusa sed foliis stipularum destitutis laminis carnosis paucilobulatis valde distincta. *N. compactae* (Gay) A. W. Hill, magis affinis, sed foliis minus lobatis, calycis dentibus minoribus, corollis majoribus, indumento e pilis longioribus laxioribusque distinguenda. (Fig. IV).

Caudex ad 15 cm. longus, crassus, apice foliis densissimis caput oblongo-ovoideum formantibus instructus. *Folia* estipulata, petiolis circiter 1 cm. longis supra subglabris marginibus et dorso stellato-pilosis ; lamina 3 mm.

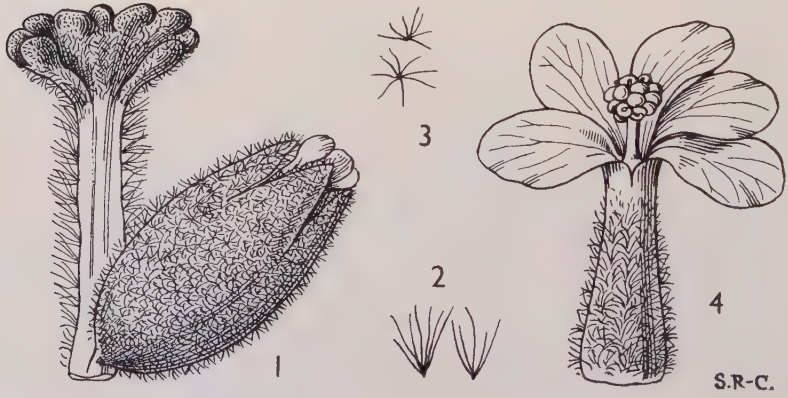

Fig. IV. *Nototriche estipulata* A. W. Hill. 1, fertile leaf, × 4 ; 2, hairs from petiole, × 16 ; 3, hairs from lamina, × 16 ; 4, corolla, × 6.

longa et 6 mm. lata, lobulis circiter 9 brevibus obtusis carnosis, utrinque stellato-pilosis. *Flores* in petiolo 2 mm. supra basin insidentes, subsessiles. *Calyx* 8 mm. longus extra ubique stellato-pilosus, tubo 5–6 mm. longo, lobis 2–3 mm. longis apice carnosulis. *Corolla* tubo stellato-piloso 4·5 mm. longo, lobis 5 suboblique obovatis 3–4 mm. longis et 1·5–2 mm. latis. *Antherae* in caput globosum tubo stamineo 1·5 mm. longo suffultum dispositae. *Carpella* immatura rostrata, rostro et dorso longe sericea, basin versus breviter stellato-pilosa.

Chile. Tacna : Cordillera Volcan Tacora, Co. Quinuta, c. 4800 m., April 1926, *Werdermann* 1401.

Nototriche herrerae *Ulbrich* (MS) *ex A. W. Hill* sp. nov. *N. pedicularii-foliae* affinis, foliis majoribus densius tomentosis, floribus multo majoribus petalis latioribus facile distinguenda. (Fig. V).

Planta completa haud visa. *Folia* 5·5–7 cm longa. *Stipulae* c. 1·7 cm. longae, lineares, stellato-tomentosae, basi cum petiolo adnatae et vaginam 2–3·5 cm. longam uti stipulae tomentosae formantes. *Petiolus* c. 3·7 cm. longus ; pars libera c. 1·7 cm. longa. *Lamina* 2·5–3 cm. longa, c. 2·3 lata, 5-lobata, lobis multilobulatis lobulis obtusis, utrinque dense stellato-tomentosa. *Flores* in petiolis inter stipulas sedentes. *Calyx* c. 1·7 cm. longus, tubo 7 mm. longo, lobis 1 cm. longis acutis, extra dense et longiuscule stellato-tomentosus. *Corolla* magna, siccitate purpurea basin versus lutescens ; tubus 2 mm. longus, pubescens ; lobi obovati basi angustati,

Fig. V. *Nototriche herrerae* Ulbrich ex A. W. Hill. 1, fertile leaf, × 1·5 ; 2, corolla, × 1·5 ; 3, hairs from upper surface of leaf, × 16 ; 4, hairs from lower surface of leaf, × 16.

apice rotundati emarginati, c. 2·3 cm. longi et 1·3 cm. lati, basi intus pubescentes. *Columella staminae* 2·2 cm. longa ; antherae in capitulum obovoideum aggregatae. *Carpella* immatura longe sericea. *Fructus* adhuc ignotus.

Peru. Without locality, *Herrera* 3679 c.

Nototriche hirtipes (*Spegazzini*) *B. L. Burtt et A. W. Hill*, comb. nov. *Malvastrum hirtipes* Spegazzini in Physis, **3,** 168 (1917).

Argentina. Salta, Nevado de Cachi, en los prados alpinos, 4000 m., March 1897, *Spegazzini* 20001.

Spegazzini's type specimen has been kindly sent on loan by Dr. L. Cabrera of the La Plata Museum, and proves to be a species of *Nototriche* not otherwise described. Its affinity is probably with *N. saltensis* Hieron., from which, however, it may be distinguished by the shorter, denser, less silky hairs of the vagina and the lower lobes of the leaf being longer. It has apparently not been re-collected since Spegazzini found it.

Nototriche longituba *B. L. Burtt et A. W. Hill*, sp. nov. corollae tubo circiter 8 mm. longo ab omnibus adhuc descriptis distincta. Forte *N. sericeae* A. W. Hill affinis sed etiam pilis in pagina superiore laminae stellatis, lamina folii fertilis reducta, calycis lobis longioribus distinguenda (Fig. VI).

Rosula circiter 3–4 cm. diametro. *Folia* circiter 2 cm. longa, stipulis anguste linearibus partibus liberis 5·5–8 mm. longis petiolo basi 7 mm. adnatis et cum eo vaginam formantibus, parte libera petiolo 5–5·5 mm. longa ; petiolus vagina stipulae facie dense et longe sericeo. *Laminae* folii fertilis simpliciter pinnatilobata, aliorum bipinnatifida lobis primariis 5, 3–4 mm. longa 1·5—4 mm. lata, supra stellato-tomentosa, subtus primum sericea deinde glabra, lobulis setoso-apiculatis. *Calyx* 9 mm. longus, lobis anguste lanceolatis 4 mm. longis, extus tenuiter stellato-tomentellus. *Corolla* tubo 6–8 mm. longo glabro, petalis obovatis oblique truncatis c. 4 mm. longis et 2 mm. latis. *Tubus stamineus* parte libera 1 mm. longa ; antherae circiter 12. *Carpella* immatura rostrata longissime sericea.

Peru. Dept. Puno, San Antonio de Esquilache ; in turf ; almost white flower, blooms from April to October throughout the dry season when the other Nototriches such as *N. longirostris* are dying down; c. 4450 m., 1 Oct. 1938, *A. Howell Williams* (comm. *Miss D. Stafford*).

Nototriche pedatiloba *A. W. Hill* in Trans. Linn. Soc. Bot. **7,** 240 (1909).

Peru. Arequipa : Vincocaya, 4376 m., Jan.-March 1903, *Hill* 78 (type). Puno : Minas de San Antonio, 4450 m., March 1943, *Sandeman* 3920/A (mixed with no 3920, *N. obcuneata* var. *cinerea* A. W. Hill).

Fig. VI. *Nototriche longituba* B. L. Burtt et A. W. Hill. 1, sterile leaf, × 4 ; 2, fertile leaf, × 4 ; 3, hairs from petiole, × 30 ; 4, hairs from calyx, × 80 ; 5, fertile leaf, × 4 ; 6, hairs from petiole, × 16 ; 7, one lobe of leaf to show long bristles and closely matted stellate hairs, × 8 ; 8, corolla, × 4. 1–4 are from one plant, 5–8 from another.

Fig. VI.

var. **appendiculata** *B. L. Burtt* var. nov. a typo appendiculis duabus e vagina pedicelli utroque latere orientibus diversa. Appendiculae aut lineares membranaceae 3–4 mm. longae marginibus pilosae aut ad dentem 0.5 mm. longum glabrum redactae. (Fig. VII).

Peru : Puno : San Antonio de Esquilache, 4570–4600 m., bare earthy slopes, 11 May 1937, *Miss D. Stafford* 705/A (type : mixed with no. 705 *N. obcuneata* A. W. Hill) : Minas de San Antonio, 4450 m., pale lilac flowers and long tap-root, in full exposure, frequent, March 1943, *Sandeman* 3931.

When Miss Stafford's collecting of this interesting variety was originally examined it was put down as a new species and the structures now termed appendages were noted first as false stipules and later as bracteoles. I think, however, that despite their occurrence being restricted to flower-bearing leaves, they cannot be regarded as true bracteoles for two reasons: in the first place they arise from the surface of the vagina and not from the flower-pedicel ; secondly their plane of insertion is the same as that of the leaves and stipules themselves, and not at right angles to it as would be expected for bracteoles. These structures are certainly not equivalent to the epicalycine bracteoles of *Malvastrum* and other genera of the family. In merely terming them appendages the way is left open for further investigation, but it may be of interest to suggest that there is some degree of parallelism with the phenomenon of diplophylly which has been

Fig. VII. *Nototriche pedatiloba* A. W. Hill var. *appendiculata* B. L. Burtt. 1, fertile leaf, × 4 ; 2, lamina, lower surface, × 4 ; 3, hairs from leaf, × c.40 ; 4, calyx opened out, × 4 ; 5, corolla, × 4 ; 6, hairs from base of corolla lobes, × 16.

described in andine species of *Caltha* and *Alchemilla*, as well as in other plants. This subject has been discussed rather fully by Troll (*Ueber Diplophyllie und verwandte Erscheinungen in der Blattbildung* in Planta, **15,** 355 : 1932 ; see especially the figure of *Caltha limbata*, p. 387, Abb. 23, II) while reference may also be made to Hill's revision of the southern Calthas (in Ann. Bot. **32,** 421 : 1918). Another somewhat comparable phenomenon is to be found in the abnormal petal-enations which have been recorded in *Primula acaulis* (see Marsden-Jones, Turrill & Mountford in New Phyt. **30,** 284 : 1931).

The provisional opinion that the specimens with well-developed appendages (Fig. VII) represented a new species was thrown into uncertainty by the discovery that other specimens of the same collecting showed these appendages only in the form of small glabrous teeth. Such teeth would be very easy to overlook if their presence was unsuspected and accordingly the type specimen of *N. pedatiloba* was re-examined, but no trace of the appendages was found. In *Sandeman* 3920/A they are also completely absent, but in *Sandeman* 3931, from the same locality, they are well developed. Under the circumstances the rather non-committal course of describing a new variety of *N. pedatiloba* seems most appropriate.

Our field knowledge of the Nototriches is still small; it must not pass without mention therefore that both these forms of *N. pedatiloba* have been collected with *N. obcuneata* A. W. Hill, in the one case with the normal form of that species, in the other with its variety *cinerea*.

Nototriche pellicea *A. W. Hill*, sp. nov. *N. turritellae* A. W. Hill affinis laminae lobis longioribus angustis, stipulis longioribus pilis majoribus, floribus albo-purpureis, carpellorum rostris majoribus praecipue differt. (Fig. VIII).

Fruticulus depressus, caespitosus, hirsutus ; caudex subterraneus, crassus, 10–15 cm. longus, ramosus ; pulvilli albo-cinerei, 1–18, 1–2 cm. lati, supra terram 5–10 mm. exstantes (?). *Folia* arcte aggregata, albo-stellato-pilosa ; petiolus 4 mm. longus ; stipulae petiolo circa ad medium adnatae et cum eo quasi vaginam membranaceam 2·5–3 mm. latam formantes, parte libera lineari-lanceolata acuta 4 mm. longa 1 mm. lata uti vagina facie glabra dorso et ad margines pilis stellatis longis dense stellato-tomentosa ; lamina ambitu oblongo-orbiculata, circiter 4·5 mm. longa et 6 mm. lata, profunde quinquefida vel septemfida omnino dense stellato-tomentosa, segmentis digitatim lobulatis, lobulis 30–50 anguste lineari-oblanceolatis pilis albis coactis arcte aggregatis. *Flores* prope petioli basin insidentes, subsessiles. *Calyx* cylindrico-campanulatus 7–7·5 mm. longus paullo supra medium 5-lobus, intus ad basin glandibus nectariferis instructis tubo glabro, lobis dorso et intus et ad margines dense stellato-hirsutis 3·25–3·5 mm. longis triangularibus acutis. *Corolla* alba 1 cm. longa ; petala clavis purpureis lateraliter instructa, obovata, basi in tubum 3 mm. longum extra hirsuta coalita. *Carpella* fere matura 3·75 mm. longa, birostrata, rostris 1·25 mm. longis dorso pilis stellatis setosis instructis ; semina reniformia, 2 mm. longa, rugosa.

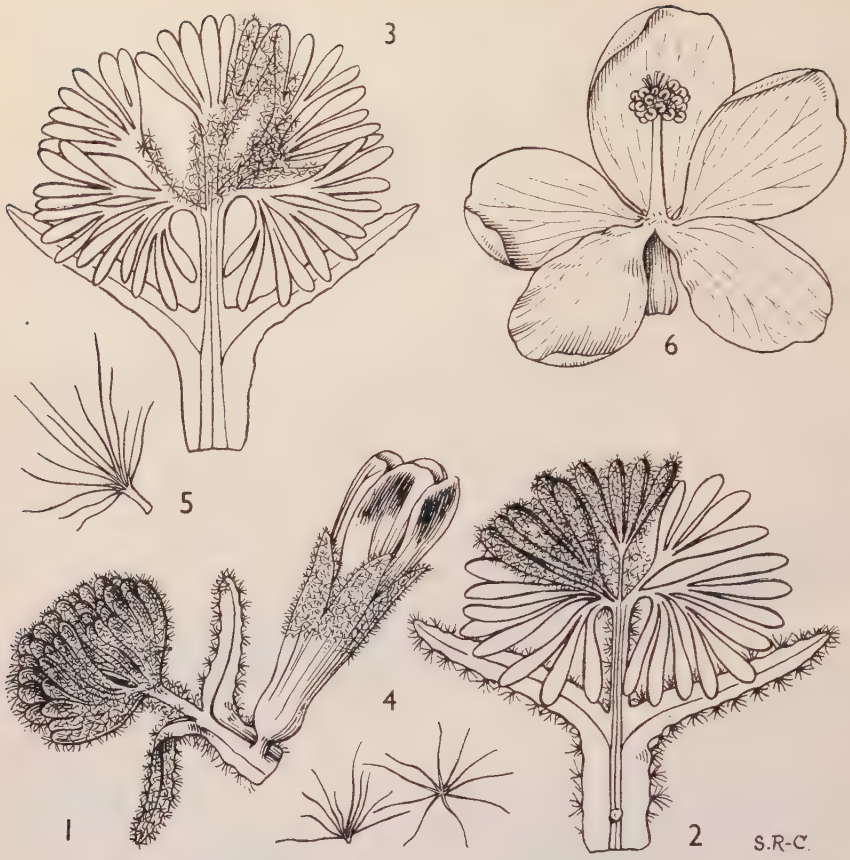

Fig. VIII. *Nototriche pellicea* A. W. Hill. 1, fertile leaf, × 4 ; 2, leaf with lamina spread out (30 lobules), × 6 ; 3, leaf with lamina spread out (46 lobules) × 6 ; 4, hairs from lamina, × 16 ; 5, hairs from petiole, × 16 ; 6, corolla, × 4.

Peru. Puno : Santa Lucia, 4570 m., barren and exposed places on the hillside, presumably grows where there is the presence of copper as these specimens are only found above veins of copper ; corolla white with purple lines on the outside of the petals, 28 Feb. 1940, *J. E. Sharpe* 168.

The following additional information has been received from Mr. F. H. Sharpe of the Lampa Mining Co. Ltd., Santa Lucia. "The local name of this plant is ' Turpa '.

Analysis for copper content:—The plant was washed and then sun dried (the whole plant was taken, roots, stalk and flowers). The sun dried plant was dried at 100°C.

Result. Water driven off, 42.4 per cent. The residue was slowly ignited and then calcined at a moderate heat in the muffle.

Result. The residue contained Ash 7·75 per cent. The ash was tested quantitively for copper.

Result. The ash contained Cu. 0.77 per cent."

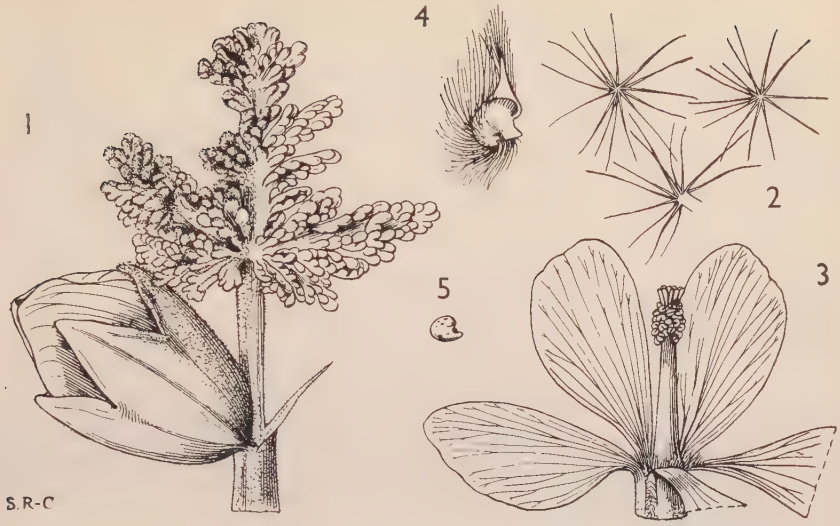

FIG. IX. *Nototriche pulverulenta* B. L. Burtt et A. W. Hill. 1, fertile leaf, × 2 ; 2, hairs from leaf, × 44 ; 3, corolla, × 3 ; 4, fruiting carpel, × 2 ; 5, seed, × 2.

Nototriche pulverulenta *B. L. Burtt et A. W. Hill*, sp. nov. *N. pedicularii-foliae* (Meyen) A. W. Hill et *N. lorentzii* A. W. Hill affinis, ab ambabus corollae tubo longiore, petalis latioribus et carpellis rostratis facile distinguenda. (Fig. IX).

Caudex crassus, usque 2·5 cm. diametro, ramosus, ramis rosulis circiter 4 cm. diametro coronatis. *Folia* circiter 3·2 cm. longa, ubique dense et breviter stellato-tomentosa ; stipulae parte libera lineari 7 mm. longa, basi cum petiolo adnatae et vaginam 6 mm. longam formantes ; petiolus 1·6 cm. longus, parte superiore a stipulis libera 1 cm. longa ; lamina ambitu late ovata, lobis primariis 5 iterum lobatis et lobulis multis parvis obtusis lobulatis. *Flores* in petiolo inter stipulas sedentes, rubri. *Calyx* 1·5 cm. longus, ut folium stellato-tomentosus ; tubus 8 mm. longus ; lobi triangulares, 7 mm. longi. *Corollae* tubus 5 mm. longus, tenuiter pubescens ; lobi obovati, apice oblique truncati, 2·8 cm. longi, 1·2 cm. lati, basi intus pilosi. *Tubus stamineus* 1–1·5 cm. longus ; antherae subsessiles, in capitulum 3 mm. longum et 2·5 mm. latum aggregatae. *Carpella* 6·5 mm. longa, rostro 3 mm. longo, dense et longe sericeo-hirsuta.

BOLIVIA. Sajama, Tola heath, 4250 m., 4 March 1927, *Troll* 3213.

CHILE. Prov. Tarapaca, Cord. Arr. Coyacagna, "Pampa-Anfang oberhalb Pena blanca, selten." 4200 m., March 1926, *Werdermann* 1082 (type).

Nototriche salina *B. L. Burtt et A. W. Hill*, sp. nov. ex affinitate N. *longirostris* (Wedd.) A. W. Hill et *N. aristatae* A. W. Hill, ab ambabus foliis multo brevioribus glabris vel subglabris recedit. Etiam affinis *N. rugosae* A. W. Hill sed foliis, ambitu similibus, glabris vel subglabris, carpellis rostratis differt. (Fig. X).

Caudex apicem versus saepe ramosus, rosulis 2–4 cm. diametro. *Folia* 1·5–2 cm. longa ; stipulae parte libera membranacea 4–5 mm. longa, 1·5–2·5 mm. lata triangulari-lanceolata acuta, basi petiolo per 5 mm. adnatae et cum eo vaginam glabram 4·5–5 mm. latam formantes ; petioli pars libera 3 mm. longa. *Lamina* ambitu ovato-cordata, lobis primariis 5 palmatim dispositis, medio aliis majore, lobis iterum lobulatis, lobulis crassiusculis obtusis, supra glabra vel sparse stellato-pubescens, pilis radiis c. 26, infra glabra. *Calyx* 5 mm. longus, lobis late triangularibus 1·5 mm. longis, extra glaber vel subglaber, intus lobis margines et apicem versus pilosus, basi nectariis 5 semicircularibus instructus. *Corolla* extra saturate purpurea, tubo 1·5–2 mm. longo glabro, petalis obovatis circiter 5 mm. longis et 3·5 mm. latis apice levissime oblique emarginatis glabris. *Tubus stamineus* 2 mm. longus ; antherae in caput globosum dispositae. *Carpella* 4–4·5 mm. longa, rostris 1·5 mm. longis, dorso longe sericea.

Peru. Dept. Arequipa, Borax Lake, Salinas Pichu Pichu ; in turf beside lake in mixture of sand and volcanic ash ; flower dark purple outside ; c. 4450 m., April 1938, *Miss D. Stafford* 1325.

Nototriche staffordiae *B. L. Burtt et A. W. Hill* species nova distinctissima a congeneris omnibus calycis lobis tripartitis valde recedit. Quoad folia *N. orbignyanae* A. W. Hill et *N. dissectae* A. W. Hill similis, sed ab illa folii lobis primariis 9 (nec 3), ab hac corollae tubo 1 mm. longo differt. (Fig. XI).

Plantae rosulas globosas 2·5– 4 cm. diametro formantes, caudice plerumque simplice rarius apice ramoso ; caudice foliisque mucilaginem copiosum continente. *Folia* circiter 1·2 cm. longa ; stipulae parte libera 7 mm. longa lineari acuta basi cum petiolo adnatae et cum eo vaginam 5 mm. longam formantes ; petiolus parte libera 3 mm. longa ; petiolus stipulaeque stellato-pilosae. *Lamina* 4–5 mm. longa, 1 cm. lata, ultra medium in lobos primarios 9 dissecta ; lobi ad medium digitatim 5 lobulati, lobulis linearibus. *Calyx* campanulatus, stellato-pilosus, 8 mm. longus, ad medium 5-lobatus, lobis ipsis paullo ultra medium trifidis, laciniis linearibus 2·5 mm. longis. *Corolla* tubo 1 mm. longo glabro ; petala obovata 6·5 mm. longa et 4·5 mm. lata, margine medio glanduloso-pubescente basin versus ciliato, valde venosa. *Tubus stamineus* 2·5 mm. longus ; antherae in caput globosum 1·5 mm. diametro congestae. *Styli* 10. *Carpella* matura haud visa, immatura breviter et obtuse rostrata, dense stellato-pilosa.

Peru. Dept. Puno, San Antonio de Esquilache, c. 4570 m., sandy slopes just below moraine, greenish flower striped brown set in rosette of grey leaves, 7 March 1938, *Miss D. Stafford* 1263.

N. staffordiae is quite the most remarkable species yet known, its trifid calyx-lobes alone being sufficient to distinguish it from all other species. Throughout the genus the base of the corolla-tube tends to adhere to the calyx, but this character is especially well marked in *N. staffordiae*. The corolla regularly disarticulates some little way above its base and leaves the flap shown (turned down) in Fig. XI 4 ; if the corolla is removed before the calyx is opened the nature of this flap may cause considerable perplexity.

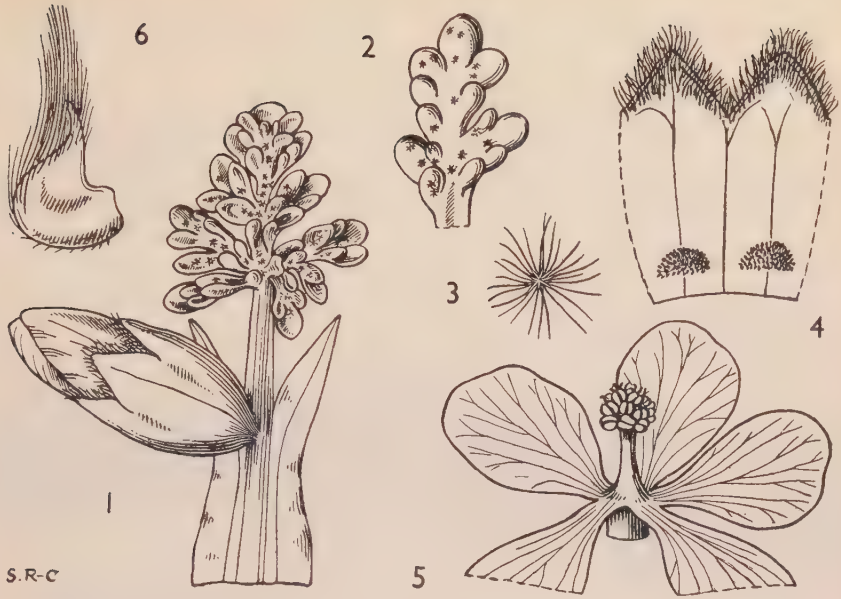

FIG. X. *Nototriche salina* B. L. Burtt et A. W. Hill. 1, fertile leaf, × 4 ; 2, part of leaf, × 6 ; 3, hair from leaf, × 24 ; 4, part of calyx from inside, × 6 ; 5, corolla, × 4 ; 6, fruiting carpel, × 6.

FIG. XI. *Nototriche staffordiae* B. L. Burtt et A. W. Hill. 1, fertile leaf (part of the right hand side of the lamina is spread out and the hairs omitted), × 4 ; 2, hairs from leaf, × 20 ; 3, calyx opened out, inner surface, × 4 ; 4, part of inside of calyx to show basal part of corolla left as flap, × 4 ; 5, corolla, × 4 ; 6, hairs from corolla, × c.23 ; 7, style and stigmata with ovary in longitudinal section, × 6 ; 8, fruiting carpel, × 6.

NEW SPECIES OF POA FROM INDIA, BURMA AND TIBET.

N. L. Bor.

Poa lahulensis *Bor*, spec. nov. ; *P. attenuatae* Trin. similis a qua culmis scabris, ligulis longioribus, dorso lemmatis sparse lanato differt.

Gramen perenne, dense caespitosum, radicibus fibrosis. *Culmi* ad 25 cm. alti, graciles, teretes, infra paniculum scabri, ex vagina superiore longe exserti. *Foliorum laminae* 2–6 cm. longae, saepe breviores, 1·5 mm. latae, lineares, utraque facie atque marginibus scabrae; innovationium folia mollia, plana ; vaginae brevissimae, scariosae; ligula 2–4 mm. longa, membranacea, truncata.

Inflorescentia panicula stricta ad 5 cm. longa, 1 cm. lata. Rhachis glabra, laevis vel scabriuscula. Rami brevissimi, 1·5 cm. longi, ascendentes, scaberrimi. *Spiculae* elliptico-acutae, 4·7 mm. longae, 2–3-florae. *Gluma inferior* 3·5 mm. longa, anguste oblongo-elliptico-acuta, apice acuminata, marginibus et apice late hyalina, 3-nervia, carina scabra. *Gluma superior* 3·75–4 mm. longa, oblongo-elliptico-acuta, 3-nervia, apice marginibusque hyalina, carina scabra. *Lemma* 3·5–4·5 mm. longum, oblongo-obtusum, inconspicue 5-nervium, carina atque nervis lateralibus intermediisque ciliatum, dorso lemmatis dimidia parte inferiore pilosum. *Rhachilla* glabra, laevis. *Antherae* 1·5 mm. longae. *Palea* lemmate brevior, carinis superne scabra, inferne ciliata. *Lana* nulla.

Lahul. Lingti, 12,000 ft.; 29 June 1941, *N. L. Bor* 15024 (Typus : Herb. Kew). Very common in Lahul, Ladak, Kunawar : also found in Nubra mountains, Kashmir, etc.

Poa rhadina *Bor*, spec. nov. ; omnibus speciebus huc usque ex India descriptis dissimilis.

Gramen annum, tenuissimum, radicibus fibrosis. *Culmi* ad 16 cm. alti, 2-nodi, laeves glabrique. *Foliorum laminae* ad 5·5 cm. longae, 1 mm. latae, plicatae, convolutae vel tortae, raro planae, aliquatenus glaucae, ascendentes, utrimque scabrae, lineares ; vaginae culmos complectentes, laeves, glabrae, vel innovationum scaberiusculae ; ligulae ad 3 mm. longae.

Inflorescentia panicula oblonga vel elliptica ad 6·5 cm. longa ; rhachis glabra, angulata, vel minute scabra ; rami inferni bini, usque ad apicem nudi, paucas spiculas gerentes ; spiculae cuneatae, ad 3·5 mm. longae, 2–3–(raro 4–) florae. *Gluma inferior* 2·5—2·75 mm. longa, oblongo-acuminata, 3-nervia, angustissime marginibus hyalina. *Gluma superior* 2·75–3 mm. longa, 3-nervia, oblongo-obovato-acuta, carina superne scaberula. *Lemma* 2·25–2·5 mm. longum, oblongo-obtusum, apice hyalinum, marginibus anguste hyalinum, inconspicue 5-nervium, carina atque nervis lateralibus inferne ciliatum, ceterum glabrum. *Lana* exigua. *Antherae* minutae, 0·5–·6 mm. longae. *Rhachilla* glabra, laevis. *Palea* oblongo-elliptica, 1·75 mm. longa, carinis scabra.

Tehri-Garwhal. Jaulea bah, Srikanta, 12–13,000 ft., *J. F. Duthie* 265 (Typus : Herb. Kew.).

Poa nitide-spiculata *Bor*, spec. nov. ; *P. himalayanae* Steud. similis a qua spiculis duplo-majoribus differt.

Gramen perenne, stoloniferum. *Culmi* ad 30 cm. alti, glabri, laeves, basi vaginis emortuis tecti. *Foliorum laminae* adscendentes, 12 cm. longae, 2·5 mm. latae, lineari-acutae (explanatae), convolutae, tortae, basis margine rotundata pilosae ; vaginae glabrae vel leviter pilosae, culmos complectentes, inferiores laxae ; ligula ad 4 mm. longa, dorso scabra.

Inflorescentia panicula laxa pyramidalis, ad 16 cm. longa, 8 cm. lata ; rami inferiores bini, flexuosi, patentes, scabriduli. Spiculae elliptico-oblongae ad 7 mm. longae, 2–3-florae, longe pedicellatae. *Gluma inferior* 4·5–4·75 mm. longa, lanceolato- vel oblongo-acuta, marginibus late hyalina, trinervia, carina superne scabra. *Gluma superior* 5 cm. longa, trinervia, marginibus late hyalina, oblongo-elliptico- vel fere obovato-elliptico-acuta, carina superne scabra. *Lemma* 6–6·5 mm. longum, oblongo-obtusum, marginibus latissime hyalinum, carina inferne ciliatum sed prope apicem scabrum ; dorso infra medium pilis albis brevibus tectum. *Lana* adest. *Rhachilla* pilosa. *Palea* carinis scabra, intra carinas pilosa.

Sikkim Himalaya. Valley running into Teesta from West, half a mile above Tangu, 13,500–14,000 ft., 13 July 1903, *Major F. E. Younghusband* (typus : Herb. Kew.). Jelep La, 14,000 ft., 2 Sept. 1945, *Dr. Bor's collector.*

Poa tibeticola *Bor*, spec. nov. ; *P. acroleucae* Steud. similis, sed ab ea spiculis minoribus, lemmatibus glabris, carentia lanae distinguitur.

Gramen annuum vel perenne, culmis foliosis. *Culmi* ad 25 cm. alti, basi geniculati, glabri laevesque. *Foliorum laminae* flaccidae, molles, ad 25 cm. longae, 2 mm. latae lineari-acuminatae, marginibus scabrae, utrimque scaberulae; vaginae laxae, nervis scaberulae ; ligula membranacea, erosa, 2–3 mm. longa, dorso scabra.

Inflorescentia panicula ad 10 cm. longa, 5 cm. lata; rhachis glabra' laevis vel leviter scabra. Spiculae elliptico-oblongae, 2–3-florae, 3·25 mm. longae. *Gluma inferior* 1·5–2 mm. longa, lanceolato- vel oblongo-acuminata (explanata), 1–3-nervia, marginibus hyalina. *Gluma superior* 2–2·25 mm. longa, elliptico- vel ovato- vel lanceolato-acuminata, marginibus hyalina, 3-nervia. *Lemma* 2 mm. longum, oblongo-obtusum, vel late elliptico-obtusum, apice et marginibus hyalinum, carina et nervis lateralibus scabrum, carina ciliatum. *Lana* nulla. *Antherae* 0·4–·5 mm. longae. Lemmate brevior *palea*, carinis scabra.

Tibet. Khambajong, 7 Sept. 1903, *Major F. E. Younghusband* (Typus : Herb. Kew.); Lhasa, Sept. 1904, *Capt. H. S. Walton.*

Poa koelzii *Bor*, spec. nov. ; *P. Litwinovianae* Ovcz. similis a qua dorso lemmatis infra medium breviter sericeo-lanato, callo vero haud lanato, antheris minoribus recedit.

Gramen perenne, dense caespitosum. *Culmi* ad 10 cm. alti, glabri, laeves, teretes, glauci. *Foliorum laminae* ad 2 cm. longae, 1·5 mm. latae,

rigidulae, plicatae, glaucae, utrimque scabrae, marginibus scabrae ; vaginae laeves, glabrae, culmos complectentes ; ligulae albae, membranaceae, ad 3 cm. longae.

Inflorescentia panicula angusta, contracta, 2·5 cm. longa, 1·5 cm. lata, aliquando 5 mm. longa, 4 mm. lata ; rami erecti ; spiculae 4·5–6 mm. longae, lanceolato-ellipticae, 2–5-florae, virides vel violaceae. *Gluma inferior* 2·25–2·5 mm. longa, lanceolato-oblongo-acuta, 3-nervia, laevis, glabra, marginibus anguste vel haud hyalina. *Gluma superior* 2·75–3 mm. longa, elliptico-acuta, ovato-elliptico-acuta vel late oblongo-acuta, 3-nervia, carina scabra, cetera glabra, marginibus haud hyalina. *Lemma* 3·5 mm. longum, elliptico-oblongo-obtusum, inconspicue 5-nervium nervis lateralibus carinaque ciliatum, dorso inferne dense brevissimeque lanatum. *Lana* nulla. *Rhachilla* glabra, laevis. *Antherae* lineares, 1·25–1·5 mm. longae. *Paleae* carinae superne scabrae, inferne ciliatae.

Kashmir. Tsakzhun Tso, Ladak, 15,000 ft., 20 July 1931, *Walter Koelz* 2385 (Typus : Herb. Kew.). Kashmir, *Walter Koelz* 2389, 2274.

Poa nepheliphila Bor, spec. nov. ; *P. annuae* Linn. similis a qua omnibus partibus majoribus, ramis verticillatis ad 4 dispositis differt.

Gramen annuum foliosissimum. *Culmi* ad 45 cm. alti, laeves, glabri. *Foliorum laminae* virides, laxae, flaccidae, planae, 16 cm. longae, 5 mm. latae, lineari-acuminatae, marginibus scabrae, supra scaberulae ; vaginae laxissimae, laeves glabraeque ; ligula brevis, erosa, 1·5 mm. longa.

Inflorescentia panicula pyramidalis, 12 cm. longa, 9 cm. lata. Rami verticillati ad quatuor, scaberuli, sparse ramosi. *Spiculae* anguste oblongae, 5–6·5 mm. longae, 4–6-florae, pallide virides. *Gluma inferior* 2–2·5 mm. longa, 1-nervia, oblongo- vel lanceolato-acuminata, marginibus anguste hyalina, glabra, carina superne scabra. *Gluma superior* 2·5–3 mm. longa, elliptico-acuminata, 3-nervia, laevis glabraque, carina superne scabra. *Lemma* 3·5 mm. longum, oblongo-obtusum, distincte 5-nervium, breviter apice et marginibus hyalinum, carina quarta parte inferiori ciliatum, nervis lateralibus ciliatum, nervis intermediis haud ciliatum. *Lana* paene nulla. *Antherae* 0·6–·75 mm. longae. *Palea* lemmate brevior, carinis ciliata.

Burma. Myitkhina, Chemli Pass, 10,000 ft., *Sukoe* 9974 (Typus : Herb. Kew.).

Poa amoena Bor, spec. nov. ; *P. sikkimensi* Bor similis a qua panicula contracta, glumis lemmatibusque majoribus differt.

Gramen annuum, humile, caespitosum, radicibus fibrosis, numerosis. *Culmi* breves, graciles, ad 4 cm. alti, usque ad paniculam foliosi. *Foliorum laminae* superiores ad 4 cm. longae, 1 mm. latae, innovationum 4 cm. longae, 1·5 mm. latae, glabrae laevesque ; vaginae culmos complectentes, nitentes, laeves glabraeque; ligula brevissima, ·5 mm. longa, late ovato-acuta, lacerata.

Inflorescentia panicula contracta fere cylindrica, ad 2·5 cm. longa, 6 mm. lata, inter folia superiora occulta. Rami ramulique erecti, inferne

singuli vel bini, scaberuli. Spiculae juvenes ellipticae, 3–4-florae, ad 5 mm. longae. *Gluma inferior* 4–4·75 mm. longa, oblongo- vel elliptico-oblongo-acuta, 1-nervia, marginibus anguste hyalina. *Gluma superior* 4·5–5 mm. longa, late elliptico-acuta vel elliptico-oblongo-acuta, trinervia, carina scabra. *Lemma* 3·5–4 mm. longum, late elliptico-oblongo-acutum, marginibus hyalinum, 5-nervium, dorso glaberrimum. *Lana* nulla. *Rhachilla* scabriuscula. *Lodiculae* 2, latae, 3-dentatae. *Antherae* 0·6–·75 mm. longae. *Palea* oblonga, carinis scabra.

KUMAON. *Strachey* 26/2, P. annua ? (Typus : Herb. Kew.).

Poa burmanica *Bor*, spec. nov. ; *P. pagophilae* Bor similis a qua lemmatis nervis omnibus ciliatis, antheris minoribus, paleae carinis scabris recedit.

Gramen annum vel perenne (?), caespitosum, gracile, basi vaginis vetustis flavulis tectum. *Culmi* ex basi radicante erecti, ad 30 cm. alti. *Foliorum laminae* lineari-acuminatae, superiores 3 cm. longae, 1·5 mm. latae, inferiores ad 6 cm. longae, 1·5 mm. latae, supra scaberrimae, infra glaberrimae ; vaginae laeves glabraeque, superiores laminis longiores ; ligula alba, scariosa, 1 mm. longa, dorso scabra.

Inflorescentia panicula laxiuscula ad 10 cm. longa, 5 cm. lata, oblonga vel pyramidalis ; rhachis glabra laevisque ; rami semper bini ; spiculae ellipticae vel oblongo-ellipticae, ad 5 mm. longae, 2–3-florae. *Gluma inferior* a latere visa subulata, 2·75–3 mm. longa, lineari-acuta vel lanceolato-acuta vel -acuminata, 1-nervia, marginibus anguste hyalina. *Gluma superior* 3–3·75 mm. longa, elliptico-oblongo- vel fere obovato-acuminata, 3-nervia, carina scabra. *Lemma* 4–4·5 mm. longum, oblongo-obtusum, distincte 5-nervium, apice breviter hyalinum, carina inferne ciliatum, superne scabrum, nervis lateralibus ciliatum, dorso pilis brevibus tectum. *Lana* copiosa. *Rhachilla* laevis glabraque. *Antherae* 1 mm. longae. *Palea* 2·5–3 mm. longa, carinis inferne ciliata, superne scabra.

BURMA. Hpimaw Pass, 11,000 ft. *Sukoe* 10074 (Typus : Herb. Kew.)

Poa phariana *Bor*, spec. nov. ; *P. calliopsi* similis sed ab ea lemmatibus compressis haud dorso rotundatis differt.

Gramen perenne parvulum rhizomatibus squamiferis. *Culmi* 3 cm. alti, usque ad paniculam vaginis virentibus basi vaginis vetustis tecti. *Foliorum* laminae rigidae, crassulae, plicatae, ad 1·5 cm. longae, 1 mm. latae, glabrae laevesque ; vaginae breves, crassae ; ligula 1·5 mm. longa.

Inflorescentia panicula parva, 1·5 cm. longa, 1 cm. lata ; rami breves, bini vel singulu ; spiculae ellipticae, 1–3-florae ; pedicelli brevissimi. *Gluma inferior* 2–2·5–3 mm. longa, lanceolato-acuta, 2-3-nervia, marginibus hyalina, violacea. *Gluma superior* 3–3·5 mm. longa, elliptico-acuta, 3-nervia, laevis glabraque, carina scabra. *Lemma* 3–3·75 mm. longum, 2–2·5 mm. latum, oblongo-rotundatum (explanatum), vel -apiculatum, 5-nervium, apice late hyalinum, plus minusve violaceum, carina inferne longe sericeo-cilatum, nervis lateralibus ciliatum, nervis intermediis glabrum vel breviter ciliatum, ceterum glabrum et laeve. *Lana* copiosa. *Rhachilla* glabra laevisque. *Antherae* 1·5 mm. longae. *Paleae* carinae multidentatae.

TIBET. Phari, 14,700 ft. *Bor* 19398 (Typus : Herb. Kew.). Tuna, 14,700 ft., *Bor* 20836.

Poa eleanorae *Bor*, spec. nov. ; species sat distincta, *P. nitide-spiculatae* Bor ut videtur similis, sed ab ea glumis quam lemmata longioribus recedit.

Gramen altum, perenne. *Culmi* ad 40 cm. alti, basi geniculati, glabri, laeves. *Foliorum laminae* adscendentes vel erectae, ad 18 cm. longae, 3 mm. latae, convolutae, utrimque scabrae, marginibus fere laeves ; vaginae laxiusculae, glabrae, laeves ; ligula 2–2·5 mm. longa.

Inflorescentia panicula ad 24 cm. longa, rhachide laevi glabraque. Rami longi, flexuosi, nodo inferiore bini. Spiculae cuneatae, 2–3-florae, 7 mm. longae. *Gluma inferior* 6–6·5 mm. longa, 3-nervia, oblongo-acuta. *Gluma superior* 6·5–7 mm. longa, oblongo-acuta, 3-nervia, marginibus hyalina. *Lemma* 5–6 mm. longum, oblongo-elliptico-ovatum, apice obtusum atque hyalinum, marginibus anguste hyalinum, conspicue 5-nervium, carina inferne ciliatum dorso scabrum. *Rhachilla* minute pilosa. *Antherae* 0·75–1 mm. longae. *Lodiculae* elliptico-acutae. *Palea* oblonga, 4·5–5 mm. longa, carinis scabris.

NORTHEAST SIKKIM, Aug. 1893, *Dr. H. A. Cummins* (Typus : Herb. Kew.).

BHUTAN. Gnatong, Sept. 1894, Dr. H. A. Cummins.

SIKKIM. Poa no. 4, J. D. Hooker.

SIKKIM AND TERAI. Herb. Sulp. Kurz, leg. 1894, *S. Kurz*, s.n.

Named in honour of my wife, Eleanor Constance, who has been my companion on many botanical expeditions in the Himalaya, Sikkim and Tibet.

Poa setulosa *Bor*, spec. nov. ; ab omnibus aliis hujus generis speciebus glumis setulosis (a latere visis) lemmate longioribus distinguitur.

Gramen perenne, gracile, caespitosum. *Culmi* ad 16 cm. alti, tenues, glabri, laeves. *Foliorum laminae* vaginis longiores, lineares, ad 7 cm. longae, 1·5 mm. latae, utrimque scabrae, marginibus scabrae, planae, aliquando plicatae ; vaginae culmos amplectentes, scabriusculae ; ligulae membranaceae, ad 3 mm. longae.

Inflorescentia panicula angusta, ad 9 cm. longa, 5 mm. lata, aliquando nutans, plerumque erecta ; rami inferne 2-ni vel singuli, scaberrimi ; spiculae cuneatae, 4·5 mm. longae, 4–5-florae. *Gluma inferior* 3·5–4 mm. longa, lineari-acuminata apice fere setulosa, 3-nervia, marginibus angustissime hyalina, carina superne scabra. *Gluma superior* 3·75–4 mm. longa, 3-nervia, lineare-acuminata, carina superne scabra. *Lemma* 2·75–3 mm. longum, oblongo-obtusum, superiori quarta parte hyalinum, marginibus anguste hyalinum, inconspicue 5-nervium. *Lana* exigua. *Rhachilla* paucipilosa. *Antherae* 0·6—·75 mm. longae. *Palea* 2 mm. longa, carinis scabra.

LOWER KUNAWAR. 15 Aug. 1847, *T. Thomson* (Typus : Herb. Kew.).

Poa jaunsarensis *Bor*, spec. nov. ; *P. pratensi* Linn. similis sed lemmatibus ligulisque longioribus recedit.

Gramen perenne rhizomatibus serpentibus. *Culmi* ex basi decumbente erecti, foliosi. *Foliorum laminae* ad 20 cm. longae, 3–4 mm. latae, utrimque et marginibus scabrae, lineares, acuminatae ; vaginae inflatae, glabrae, laeves ; ligulae 2·5-4·5 mm. longae, membranaceae, dorso scabrae.

Inflorescentia panicula oblonga, e vagina superiori eminens, 10 cm. longa, 2·5 cm. lata ; rami conferti, inferne 2-ni vel singuli, erecti, scabri, glabri ; spiculae 5 mm. longae, 2–3-florae, elliptico-acutae. *Gluma inferior* 2·75–3·5 mm. longa, lanceolato-, ovato- vel oblongo-acuta, 1-nervia, subinde trinervia, carina scaberrima. *Gluma superior* 3·5–3·75 mm. longa, elliptico-oblongo-acuta, trinervia, marginibus late hyalina, glabra, laevis, carina scabra. *Lemma* 3·5–3·75 mm. longum, late oblongo-elliptico-obtusum, 5-nervium, carina nervis lateralibusque ciliatum, dorso glabrum. *Lana* copiosa. *Rhachilla* glabra, laevis. *Antherae* circiter 1 mm. longae. *Paleae* carinae scabrae.

Kumaon, N.W. Himalaya. Kutti Yangti Valley, Byans, 12–13,000 ft., 30 July 1886, *J. F. Duthie* 6224 (Typus : Herb. Kew.). Also in Lahul (*Bor* 8727, 14804) ; Gilgit (*Duthie* 12392) ; Kashmir (*Duthie* 12460).

Poa poiphagorum Bor, spec. nov. ; *P. lahulensi* Bor similis a qua dorso lemmatis prorsus glabro, lanae absentia differt.

Gramen perenne, dense caespitosum, radicibus fibrosis numerosis. *Culmi* 15 cm. alti, laeves, glabri, teretes, ex vagina superiore longe exserti. *Foliorum laminae* ad 6 cm. longae, plerumque breviores, 1·5 mm. latae, rigidae, planae, plicatae vel involutae, aliquatenus glaucae, utrimque scabrae ; vaginae laxae ; ligulae ad 3·5 mm. longae, sed saepe breviores.

Inflorescentia panicula angusta vel angustissima, ad 5 cm. longa, 1·5 cm. lata ; rami breves, scabri. *Gluma inferior* 2·5–3 mm. longa, lanceolato- vel elliptico-acuta, 3-nervia, violacea. *Gluma superior* 2·75–3 mm. longa, ovato-acuta vel elliptico-acuta, 3-nervia, viridis vel violacea, glabra, laevis, carina scabra. *Lemma* 2·75–3 mm. longum, chartaceum, 5-nervium, dorso nervisque glaberrimum vel raro carina nervis lateralibusque brevissime ciliatum. *Rhachilla* glabra vel minute pilosa vel scaberula. *Lana* nulla. *Antherae* 1·5–2 mm. longae. *Palea* carinis scabra.

Sikkim. Temu La, 16,000 ft., *Rhomoo Lepcha* 374 (Typus : Herb. Kew.) Common in Sikkim and in southern Tibet.

var. **lanata** var. nov., a typo callo lanato differt.

Tibet. Rongshar Valley, 12,000 ft., *Hingston* (Typus : Herb. Kew.).

Poa wardiana *Bor*, spec. nov. ; *P. himalayanae* Nees affinis sed ab ea lemmatibus conspicue nervatis, scabris, palea brevioribus recedit.

Gramen gracile, ut videtur perenne. *Culmi* ad 35 cm. alti, recti, laeves glabrique, infra paniculam scaberuli. *Foliorum laminae* ad 8 cm. longae,

2 mm. latae, flaccidae, molles, utrimque marginibusque scabrae ; vaginae culmos complectentes, striatae ; ligulae truncatae, erosae, 1·5 mm. longae.

Inflorescentia panicula delicatula : rami inferiores bini, longi, flexuosi, scabri. *Spiculae* oblongo-ellipticae, 4·5 mm. longae, 2–3-florae. *Gluma inferior* 2·5 mm. longa, ·8 mm. lata, oblongo-acuta (explanata), 1-aliquando 2-nervia, marginibus angustissime hyalina, carina scabra, ad apicem violacea. *Gluma superior* 2·5 mm. longa, 1·2 mm. lata, ovato-, lanceolato-, vel elliptico-acuta, trinervia, marginibus anguste hyalina, ad apicem violacea, carina scabra. *Lemma* 3 mm. longum, 2·5 mm. latum, explanatum late oblongo-obtusum, conspicue 5-nervium, nervis carinaque atque dorso scabrum, apice atque marginibus hyalinum, basi carinae sparse ciliatum. *Lana* nulla. *Rhacillla* glabra laevisque. *Antherae* 0·75 mm. longae. *Palea* flosculi superioris lemmate longior, carina scabra.

Balipara Frontier Tract, Assam. Poshing La, 10,000–12,000 ft., " A shade grass scattered along the path in Silver Fir-Rhododendron climax," *Capt. F. Kingdon-Ward* 13990 (Typus : Herb. Kew. et Herb. Dehra Dun).

Poa gamblei *Bor*, spec. nov. ; *P. Falconeri* Hook. f. ut videtur affinis sed ab ea lemmate glabro lana nulla distinguitur.

Gramen perenne, stoloniferum. *Culmi* ad 45 cm. alti, basi vaginis emortuis tecti, graciles, basi decumbentes, paniculam infra scaberuli, glabri. *Foliorum laminae* lineare-acutae ; superiores breves, rigidae, erectae, 8 cm. longae, 2 mm. latae, plicatae, utraque facie atque marginibus scabrae ; inferiores ad 8 cm. longae, 3 mm. latae, marginibus scabrae ; vaginae inferiores scabrae, laxae ; ligulae breves, 1·5 mm. longae, apice rotundatae.

Inflorescentia panicula diffusa ; rami inferiores bini, ad 7 cm. longi, flexuosi, scabri. *Spiculae* 6·5 mm. longae, 3–4-florae, cuneatae. *Gluma inferior* 5 mm. longa, 1·5 mm. lata, anguste elliptico-oblonga (explanata) violacea, 3-nervia marginibus haud hyalina, dorso ad apicem scabra. *Gluma superior* 5·5 mm. longa, 2 mm. lata, explanata late elliptico-acuta, 3-nervia, marginibus haud hyalina, dorso ad apicem scabra. *Lemma* 5·5 mm. longum, 2·5 mm. latum, oblongo-obtusum, rigidum, carinatum, apice aliquatenus rotundatum, conspicue 5-nervium, apice hyalinum, violaceum, dorso scabrum, nervis carinaque haud ciliatum. *Lana* nulla. *Antherae* 2·75 mm. longae. *Palea* anguste oblonga, carinis scabra.

Madras. Nilgiris District, Ootacamund, 7000 ft., *J. S. Gamble* 18129 (Typus : Herb. Kew.). Cairn Hill, Nilgiris, *J. S. Gamble* 21378. Nilgiris, Kundahs, May 1928, *P. V. Mayuranathan.*